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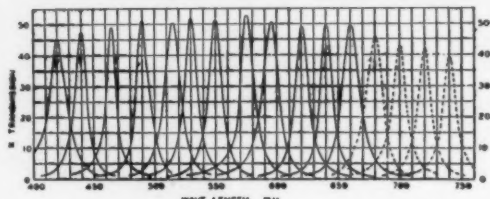
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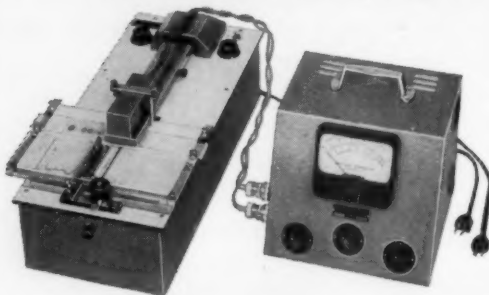
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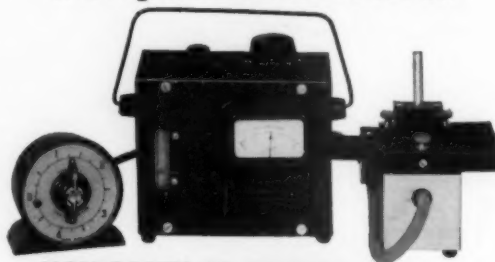
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Compromise to the Fourth Power

Washington, D.C., has recently been the scene of an unusual, sometimes irritating, and probably very influential meeting—the White House Conference on Education. From every state and territory some 2000 delegates came together to talk about the nation's schools. For months beforehand, a staff had been preparing for the conference; for months beforehand, preparations had also been underway throughout the nation, for all 53 states and territories and 3600 communities, counties, and regions had held meetings to discuss their school problems and to prepare for the big national meeting.

The problem of giving 2000 delegates an opportunity to express their own views was solved by dividing them into 167 discussion groups of about a dozen members each. All groups discussed the same problem at the same time. Each chose a chairman. Later the chairmen got together in 16 groups to pool the considerations of the 167 primary groups. These 16 groups each elected a second-order chairman, and the 16 individuals so elected met in two groups of eight each for a third round of discussion. The two tables of eight each elected a third-order chairman, and the two persons so honored prepared a final report that one of them presented to the entire assemblage of 2000. Thus the conference considered six aspects of elementary and secondary education: What should schools accomplish? How can they be organized more efficiently and economically? What are school building needs? How to get enough good teachers? How can schools be financed? And how can public interest be maintained?

The procedure followed was intended to make the final report a distillation of all preceding discussions. In that purpose, the procedure was probably successful. But, it quickly became evident, only the heaviest platitudes can withstand so much distillation. Someone quipped that since the report represented the fourth power of compromise, one should not expect much that is new and startling in it.

Even so, worth-while recommendations did get in, such as the plea for greater support for research in the U.S. Office of Education, a recommendation that states give greater attention to such special subjects as science and mathematics, and general recognition of the necessity of more generous financial support.

But criticism that the conference did not produce a wealth of new ideas misses its major effect. A great many people, from many walks of life, spent several days thinking about the increasingly severe problems of the nation's schools, teachers, and school children. Half a million people participated in local meetings. Further conferences are planned. The thinking of many people has been affected. A southern judge remarked that he had thought his state was doing a pretty good job; now he knew that much more needed doing. A midwestern state senator planned to go home to work for improved school organization. A scientist who had long been interested in school affairs said he was now much better informed on some of those matters. State governors and legislators, businessmen, club women, school officials, teachers, a few students, a few scientists, and others met together to consider the nation's interest in how its children are taught. Millions of other persons read or heard news reports and had their interest stirred a bit more than usual. Even if the formal report is thrown away, the simple fact that the conference was held can be of lasting benefit to education in the United States.—D.W.



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* Henry P. Kalmus and George O. Striker, Rev. Sci. Inst., 19, 79 (1948).

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The New Utopia

Morris S. Viteles

Throughout the history of civilization man has been intrigued by the possibility of remaking this unsatisfactory world into a better one—one formed in the image of his personal perceptions, aspirations, and values. In saying this, I do not have in mind the broad conceptualizations of philosophers and religious leaders, such as the Ten Commandments of Moses, the Golden Rule of Jesus, the Five Relationships of Confucius, the Four Noble Truths and the Noble Eightfold Path of Buddha, or other ideal standards of conduct that have exercised tremendous influence in a variety of very different cultures. On the contrary, I am referring to detailed plans for reordering the formal organization of the community, for spelling out the structure, the details of daily life, and the specific patterns of individual form and conduct. Exemplified early in Plato's *Republic*, such projects have, through the writings of Sir Thomas More, made the word *utopia* a commonplace conception in the languages of the world.

Plans for creating similar seats of "ideally perfect society and political life" (1) have come from a variety of sources. Literary men such as Samuel Butler (2) in England, Edward Bellamy (3) in the United States, and in a sense Cyrano de Bergerac (4) in France—to mention only a few—found means for describing the inadequacies of civilizations known to them and fertile outlets for their imaginations in the design of fairer worlds—in the pursuit of the perfect way of life, or in the words of Matthew Arnold, of "sweetness and light" (5) as a way of life.

The author is professor of psychology at the University of Pennsylvania. This article is based on an address delivered at the closing session of the 12th congress of the International Association of Applied Psychology in London, 22 July 1955.

Until recently the architects of utopia have, perforce, found it necessary to accept man as he is and to satisfy themselves with manipulating his environment and his institutional relationships—primarily economic and political—as a way of remolding the world and, as the great son of the Persian tentmaker wrote, bringing it "nearer to the Heart's desire" (6). It will be recalled that Rousseau, in fact, took the position that man himself—*natural man*—is a noble creature, corrupted only by the artificial and degrading civilization imposed on him (7). The utopias of Rousseau and of his literary disciples such as Chateaubriand (8), were thus quite consistently characterized by a rejection of the artificial trappings of so-called civilized life and a return to primitive forms of existence.

Utopian Engineering by the Psychologist

Today, by contrast, the creators of a "brave new world" undertake their task with avowed capacity actually to remake man himself and thereby to achieve the states of *inner* and *outer* perfection which, in the past, were promised only in the afterlife. As illustrated in the satirical novel by Aldous Huxley (9), biology furnishes the mechanism for modifying inherent and supposedly inflexible characteristics of the individual by manipulation of the embryo itself; physiology and psychology provide the tools for early and complete conditioning of the individual to a man-made world of perfected order.

The application of such psychological tools for this purpose finds even more concrete expression in the creation of *Walden Two* (10), a new utopia designed by the outstanding American psy-

chologist Burrhus F. Skinner. Here, with unbounded faith in the capacity of a science of human behavior to change such behavior, Skinner subordinates "natural man" to the socially adaptive and conforming influences of scientific methodology.

Skinner's approach to a new utopia is epitomized in the answer given by the founder of *Walden Two* to a question bearing on the failure of earlier attempts to establish perfected centers of community living. The crucial fault, he points out, was the absence of *psychological management*. "The cultural pattern was usually a matter of revealed truths and not open to experimental modification—except when conspicuously unsuccessful. The community wasn't set up as a real experiment, but to put certain principles into practice. These principles, when not revealed by God, flowed from a philosophy of perfectionism. Generally, the plan was to get away from government and to allow the natural virtue of man to assert itself. What more," adds Frazier, the fictional protagonist of the new utopia, "can you ask for as an explanation of failure?" (10, p. 129).

Beliefs underlying this approach find expression in Skinner's scholarly writings, particularly in his book *Science and Human Behavior* (11). It is here that Skinner commits himself to the view that the deliberate manipulation or control of cultural practices and human behavior is a necessary feature of any civilization and the road to progress toward a better way of life. It is here also that he formulates *survival* as a criterion in evaluating control practices. Likewise, the crucial role assigned to a science of human behavior in relation to controlled cultural change is made apparent in this text. "We have," he writes, "no reason to believe that any cultural practice is always right or wrong according to some principle or value regardless of the circumstances. . . . Science," he adds, "helps us in deciding between alternative courses of action by making past consequences effective in determining future conduct. . . . The formalized experience of science, added to the practical experience of the individual in a complex set of circumstances, offers the best basis for effective action" (11, p. 436).

It is noted by Skinner that experimentation involving control of cultural practices may yield findings that are distaste-

ful to Western thought, which has emphasized the importance and dignity of the individual and the philosophy—accepted, according to Skinner, by many schools of psychotherapy—that “man is the master of his own fate” (12, pp. 44–68). “If,” he concludes, “science does not confirm the assumptions of freedom, initiative, and responsibility in the behavior of the individual, these assumptions will not ultimately be effective either as motivating devices or as goals in the design of culture. . . . We may console ourselves with the reflection that science is, after all, a cumulative progress in knowledge which is due to man alone, and that the highest human dignity may be to accept the facts of human behavior regardless of their momentary implications” (11, p. 449).

Implicit in this quotation is the view that this approach involves no value judgments by the scientists who conduct experiments in controlling cultural design and modifying human behavior. In fact, Skinner elsewhere states explicitly that “our problem is not to determine the value or goals which operate in the behavior of the cultural designer; it is rather to examine the conditions under which design occurs” (11, p. 433). However, it does not seem clear, at least to me, that Skinner has adhered to this position. In spite of his assertion to the contrary, the choice of survival as a criterion for evaluating control, and the choice of a science of human behavior as mediating mechanism in deciding with respect to alternative courses of action, appear very clearly to be value judgments. Furthermore, with the literary license allowed to the novelist, Skinner in *Walden Two* has exercised wide latitude in this respect and thereby has revealed the dangers that arise when, in a life situation, the psychologist does, in fact, implement the view that his science makes him the architect preeminent of the utopian way of life.

There occurs, for example, a discussion of the community educational program. A visitor, named Castle, raises a question concerning student motivation. “Why,” he asks, “do your children learn anything at all? What are your substitutes for our standard motives?”

To make clear the issue under consideration requires, unfortunately, a somewhat lengthy quotation from Skinner’s novel, which goes on as follows (10, pp. 101–102).

“Your ‘standard motives’—exactly,” said Frazier. ‘And there’s the rub. An educational institution spends most of its time, not in presenting facts or imparting techniques of learning, but in trying to make its students learn. It has to create spurious needs. Have you ever stopped to analyze them? What are the “standard motives,” Mr. Castle?’

“‘I must admit they’re not very attractive,’ said Castle. ‘I suppose they consist of fear of one’s family in the event of low grades or expulsion, the award of grades and honors, the snob value of a cap and gown, the cash value of a diploma.’

“‘Very good, Mr. Castle,’ said Frazier. ‘And now to answer your question—our substitute is simply the absence of these devices. We have had to uncover the worth-while and truly productive motives. . . .’

“‘We made a survey of the motives of the unhampered child and found more than we could use. Our engineering job was to preserve them by fortifying the child against discouragement.’ . . .”

Following a description of the use of “conditioning” in building up tolerance to discouragement, the founder of *Walden Two* goes on to say, “Building a tolerance for discouraging events proved to be all we needed. . . . The motives in education, Mr. Castle, are the motives in all human behavior. Education should be only life itself. We don’t need to create motives. We avoid the spurious academic needs you’ve just listed so frankly, and also the escape from threat so widely used in our civil institutions. . . . We don’t need to motivate anyone by creating spurious needs.”

Skinner uses here, of course, a device commonly employed by both literary men and expert propagandists in lulling the reader into at least the provisional acceptance of his viewpoint. It is that of molding attitudes by the choice of appropriate adjectives, illustrated in the quotation by the phrases “the snob value of a cap and gown,” “the cash value of a diploma,” and most of all by the repeated reference to “spurious needs.”

Social Science and Social Reform

The last of these phrases, “spurious needs,” brings into relief the situation that has produced both the title of this address and its content. This, briefly, is the increasing tendency on the part of the psychologist to inject value judgments in a manner that makes it increasingly difficult, especially for the layman, to determine when the psychologist is dealing with facts and principles derived from experiments, or when he is merely presenting his own value judgments (13). It has, in other words, become increasingly difficult to know when the psychologist speaks with the authority of science, or when he is playing the role of the social reformer while clothed—or even disguised—in the garb of the scientist.

In saying this, I am, naturally, not denying the right of the psychologist to his opinion—to his own value judgments. He, as every other free man, is entitled

to believe that a cap and gown is, indeed, a stigma of snobbery; that a diploma is prized only for its cash value; that money is crass; that, as Rogers believes, religion, and also Freud, are to be criticized for permeating our culture with the false concept that man is sinful (12); that prejudice and discrimination are used by dominant groups to defend their vested interests (14), and so forth. As a citizen, the individual psychologist is free to express any such opinion, regardless of how unpopular it may be among his professional colleagues or among the mass of people in the culture of which he is a part. It is not his privilege, however, to clothe the source and personal nature of such opinions in the language or form of scholarly writing to the point where it would appear that they are the outcome of scientific inquiries.

Reference to *Walden Two* as a device for presenting this issue does not reflect the opinion that Skinner has been particularly remiss in this respect, in comparison with other psychologists. This fictional representation of his personal views by a notable and conscientious scientist merely provides a springboard for the discussion of a major issue in psychology. It is an issue that grows in significance with the multiplication of publications where the failure to distinguish between conclusions supported by experimental evidence and those representing personal value judgments becomes a medium for the support of cultural practices or changes deemed to be desirable by the scientist.

The frequency with which this occurs lends support to the opinion that many psychologists have reverted to Plato’s conception of method, as stated in *Phaedo*, namely, “This was the method I adopted: I first assumed some principle, which I judged to be the strongest, and then I affirmed as true whatever seemed to agree with this . . . and that which disagreed I regarded as untrue.” The fact that, in most instances, the individual psychologist is not engaged in the patterning of an entire utopia, but rather in what Popper in *The Open Society and Its Enemies* (15) has called “piecemeal social engineering,” does not diminish the seriousness of the situation under discussion, especially in an era that has raised the psychological expert to a level of considerable influence.

Essays in Piecemeal Social Engineering

Many examples of this situation can be cited. A thought-provoking article by Gardner Murphy, entitled *Human Potentialities*, furnishes one such illustration. Here, Murphy formulates five basic principles for “permitting the discovery

of human potentialities," including among these, as a negative principle, to avoid the competitive. "Not," he wrote, "because competition is always bad, but because it frustrates and benumbs those who fail, and because for those who succeed it can at best give only the ever iterated satisfaction of winning again and again. In this direction lies, of course, a convenient way of maintaining a status minded society; but I am speaking of something quite different, namely, the release of human potentialities" (16).

Accepting Murphy's statement that he is interested primarily in the release of human potentialities, there still arises the question whether there are, indeed, facts available to support the use of the word *principle* instead of *judgment* or *opinion* in the context of his statement. Furthermore, the reference to "status minded" society introduces at least an implication that "competition" is a socially undesirable practice, as well as a handicap to the full and healthy development of the individual.

Examination of the literature—particularly that of social psychology—indicates that competition is quite frequently treated as though it has been demonstrated with considerable certainty that this is a noxious cultural practice. In addition, by associating capitalism with competition, onus is reflected on the capitalistic system, as compared with other and, by implication at least, superior economic and social systems. Thus, according to Newcomb, the higher frequency of exposure to failure, threat, and insecurity that exists where importance is attached to competitive success makes it "no wonder that psychiatrists like Alfred Adler found feelings of discouragement and inferiority prominent in the neuroses of Western society" (17). In a somewhat broader context, Asch states the requirements that distinguish between a "society of atoms, each arrayed against all, organized on the predatory principle of *homo homini lupus* and one organized around the idea of a community of men." The former, it is made clear, is one built on the "calculation of private profit." Only an inferior brand of social organization can be anticipated from an "ego-centered thesis" that "describes the balance achieved in society as an uneasy and antagonistic mutual limitation of each by all" and that "reduces every trace of solidarity to the pattern of relations in the business market" (18).

How many facts, from how many studies, are available to support such judgments with respect to the individual and social roles of competition? Newcomb's reference to Adler's statement concerning the frequency of neuroses in Western (competitive and capitalistic) society

merely raises again the perennial questions concerning what constitutes "neurosis"; concerning the amount and quality of research underlying psychiatrists' dicta, and even concerning the nature of the sample observed by the psychiatrist. The last of these questions is neatly disposed of in the reply given to the query "Whom has the psychiatrist been observing?" in a humorous but nevertheless challenging book entitled *How to Lie with Statistics*. "It turns out," it is pointed out, "that he has reached this edifying conclusion from studying his patients, who are a long, long way from being a sample of the population. If a man were normal, our psychiatrist would never meet him" (19).

Perhaps the situation with respect to research on competition versus cooperation is not quite as bad as this. However, the fact remains that studies bearing on the effects of competition on the individual and on groups are few in number. Furthermore, the size and nature of the samples involved in such studies, the restricted and frequently artificial settings in which they are conducted, the manipulation of theoretical concepts and experimental variables, and so forth, make it quite impossible to derive broad value judgments pertaining to the role of competition in social progress. Available experimental findings do not provide grounds for discarding lightly the opinion, expressed in a prophetic dissent by Justice Holmes of the Supreme Court of the United States, that competition (between groups as well as between individuals) is a social advantage since it "is worth more to society than it costs" (20). Certainly, the hypothesis that competition—reaching even the dimensions of conflict—contributes to individual and group progress cannot be abandoned. This, in fact, is the position taken with respect, at least, to the social role of conflict in industry by a number of contributors to a recent book, *Industrial Conflict*, edited by Kornhauser *et al.* (21).

This reference to industry brings to mind another illustration of the presentation of value judgments unsupported by facts derived from research. There has been considerable thought given to the role of the union, in comparison with that of other social organizations, in providing "substitute" satisfactions for wants and needs that are presumably frustrated by the job conditions under which people work in modern industry. Writing within the context of a scholarly work, Krech and Crutchfield state with conviction that "the labor union, by and large, can better meet most of the workers' needs and demands than can other organizations. As we have seen . . . most social organizations will generally reflect the major needs of its members, and labor unions will therefore be more 'tailored'

to the needs of the workers than will religious organizations or other less homogeneously composed social organizations" (22, *italics mine*).

In 1948, at the time this statement appeared, there was little available in the way of research findings bearing on the workers' perception of other social organizations (apart from the industrial plant) in comparison with their perception of the union. So far as religious organizations are concerned, there were not, to my knowledge, any facts that would support or disprove the conclusion reached by Krech and Crutchfield.

Studies conducted since 1948 do not show that workers themselves perceive the union as the prime medium for satisfying most of their needs. Thus, in a study of a teamsters union, by Rose, 75 percent of members referred to "getting higher wages," and 31 percent to getting "job security," as a purpose of the union (23). No other single purpose is mentioned by as many as 20 percent of the workers involved. Similar findings, in other studies dealing with the worker's perception of the union (24), likewise throw serious doubt on the view that the union does or can satisfy the needs for participation, for self-expression, for self-respect, for status, or a host of other psychological and social needs better or more fully than do other types of social organizations.

There is still little, if any, evidence bearing specifically on the question whether labor unions can or will be more "tailored" to the needs of workers than will religious organizations. It seems true, as Krech and Crutchfield contend, that unions are, in fact, assuming accessory functions of the type that enlarge the potential for the satisfaction of more and more needs of its members. As is also pointed out by Krech and Crutchfield, this is likewise true of religious organizations. They provide no evidence that one is doing this to a greater extent or with better results than the other. Furthermore, although current research on dual loyalties—for example, to the union and the religious organization—points to the fact that each organization may better satisfy some specified need, findings do not in any sense settle the question whether either is or can be better "tailored" to provide direct or "substitute" satisfactions for most needs.

In using this illustration, I am not, for the moment, concerned with the evaluation of the role of either the union or of religious organizations in the life of the individual and in modern society. I am concerned with treatment of the roles of these and of other social organizations by psychologists in a manner that confuses theory or value judgments with facts—in a manner that may, with or without intent, mold the attitudes of the

reader or student with respect to social institutions rather than enlighten him with respect to their roles as revealed by research. The finding, reported in a recent study by Keehn, that the resemblance within a group of well-known psychologists ($N=27$) was confined to high homogeneity with respect to a continuum of "humanitarianism and anti-religionism" (25) perhaps lends special pertinence to the illustration under consideration.

Many illustrations of premature and also biased generalizations from relatively little in the way of facts are to be found in industrial applications of psychology that, as may be suspected, are of special interest to me. Thus, earlier discussions of the effects of repetitive work, and also current discussions of automation have suffered both from an absence of historical perspective and from the "naturalistic fallacy" in which subjectively determined goals and moral values are confused with the empirical methodology and outcomes of scientific research (26).

A necessarily brief illustration from another area of research and application may help to reveal the wide scope of the problems under discussion in this article. In a volume entitled *Motivation and Personality*, Maslow takes the position that "science is based on human values and is itself a value system" (27, p. 6). Acting on this premise, he has described a utopia, called *Eupsychia*, characterized by the fact that all men are psychologically healthy. Essentially, according to Maslow, this means that "the inhabitants of Eupsychia would tend to be permissive, wish-respecting, and gratifying (whenever possible), would frustrate only under certain conditions . . . and would permit people to make free choices wherever possible. Under such conditions," adds Maslow, "the deepest layers of human nature could show themselves with great ease" (27, p. 350).

Here Maslow appears to accept what Skinner has described as a dominant view characterizing the theory and practice of psychotherapy (expressed earlier in the primitivism of Rousseau), namely, that man is essentially good and kind and is corrupted only by social forces imposed from without. Thus, Rogers, the high priest of psychotherapy, takes issue with Freud's view (28) that man's basic nature—the *id*—"is primarily made up of instincts which would, if permitted expression, result in incest, murder, and other crimes" (12, p. 56). The contrary, Rogers contends, is the fact! "One of the most revolutionary concepts to grow out of our clinical experience," he writes, "is the growing recognition that the innermost core of man's nature, the deepest layers of his personality, the base of his 'animal nature,' is positive in character

—is basically socialized, forward-moving, rational and realistic" (12, p. 56). The goal of psychotherapy therefore naturally becomes that of providing a client-centered, permissive atmosphere that leads to *adjustment* through the revelation—by the individual to himself—of the essentially "self-preserving and social inner core" of his personality (29).

Which of these views—that of Freud, or that of Rogers—can we accept as scientific truth? In what measure are the tremendous structures of psychoanalysis and psychotherapy built on a foundation of empirically established facts? And to what extent can we accept adjustment itself as a prescription for living "as a socially desirable goal?" Or is there justification for Lindner's view that the whole concept of adjustment "is a mendacious lie, biologically false, philosophically untenable, and psychologically harmful"—which, according to Lindner "disregards many if not all the pertinent facts of human nature" and represents "an untruth that is rendering man impotent at a time when he needs the fullest mastery over his creative abilities" (30).

The Scientist and His Moral Values

Whether this is true or not (31), the sad fact is that the immense superstructure of psychological practice often rests on a foundation of scattered, splintered, and tinderlike data that could fall apart with the most meager essays in the way of further exploration through the use of available scientific techniques. Psychologists and psychiatrists alike seem loath to acknowledge this. Only too often we seem possessed—not by an appropriate and deep sense of humility—but, instead, with an urge to substitute our value judgments—frequently uncontaminated by facts—for those held by others and as perhaps expressed by colleagues in related fields of economics, history, political science, philosophy, religion, and so forth. Like Scaphio and Phantis in the delightful comedy *Utopia Ltd.* by W. S. Gilbert, we seek to enter the world of affairs to the voice of a chorus that sings (32)

"O make way for the Wise Men!
They are prizemen—

They're the pride of Utopia—
Cornucopia

Is each in his mental fertility.
O they never make a blunder,

And no wonder,
For they're triumphs of infallibility."

It is possible that in this paper—and also in my earlier publications—I may appear to have clothed myself in the mantle of the "wise man." It is unquestionably

evident that much if not all that I have said here is in the nature of value judgments. In fact, I make no claim to the scientific authenticity of my judgments. Furthermore, this article does not purport to set up a scientific system of moral values, or even to support the position that this can be done.

Nevertheless, moral values are involved, and these require serious thought whenever psychologists turn their attention to newer developments in the way both of the theory and applications of the science of human behavior. This seems the occasion to recall the description, by Pliny, of the activities of the clothiers of Rome who met in the Forum in the autumn of each year and whose activities made *caveat emptor*—let the buyer beware—the expression of bitter experience on the part of the Romans (33). The very fact that the infant science of human behavior can already make important and useful contributions to human welfare does not entitle us to play the role of the architects preeminent of the new utopia.

We are not privileged to let our individual moral values—instead of hard facts—set our standards of conduct as scientists. We cannot conscientiously permit even a despair of finding ethical absolutes to lead us, in the words of Keckskemeti, to "smuggle them in behind intellectual, psychiatric, and political screens" (34). There is no time better than now to recall the forceful appeal by A. V. Hill that "scientists should be implored to remember that, however accurate their scientific facts, their moral judgments may conceivably be wrong" (35). Let us take pride and courage in the dedication of our work as scientists to the cause of mankind—to defending and enhancing the worth of the human being (34, p. 371). We must, nevertheless, simultaneously keep constantly in mind the necessity for clearly separating our thinking and wishes with respect to ordinary affairs from the "critical habits of thinking" (35) that characterize the true scientist and establish the inherent integrity of a science.

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- lications cited here, particularly reference 26, and, in addition, to a chapter on "Values and value orientations in the theory of action: an exploration in definition and classification," by C. Kluckhohn et al., in *Toward a General Theory of Action*, T. Parsons and E. A. Shils, Eds. (Harvard Univ. Press, Cambridge, Mass., 1951), pp. 399–433.
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Evidences of Climatic Change from Ice Island Studies

A. P. Crary, J. Laurence Kulp, E. W. Marshall

Arctic Ocean ice islands were located by the 58th Reconnaissance Squadron of the U.S. Air Force in 1946 during routine weather flights (1). One of these islands, T-3, was occupied by the Air Force for the collection of meteorological, oceanographic, and geophysical data (2) from March 1952 until May 1954. The size of T-3 is about 11 by 5 miles, its thickness is about 170 feet and, except for the annual snow layer, it consists of ice of density 0.89 to 0.92 grams per cubic centimeter.

Surface dirt, various plant and animal samples, and the presence of morainal material give evidence that this island was at one time near land. It was probably part of the ice shelf, the remnants of which are still present along the shores of northern Ellesmere Island. During 1952 and 1953, cores were obtained through the upper part of the island; numerous horizontal dirt layers containing widely differing amounts of dirt were

found. The dirt in the layers was collected from one of the deep holes, and weights were obtained for all except the smallest layers. The weights are shown in Fig. 1. From this figure, it can be seen that a large surface dirt layer is present, and below this, in the first 90 feet of ice, there are about 85 layers containing widely varying amounts of dirt, but all containing considerably less than the layer at the surface. Near 90 feet, a very heavy layer is found that contains an approximate weight of 5 to 6 times that of the surface layer. The ice was cored for 20 feet below this layer and found to be free of dirt.

Preliminary petrologic studies of the ice character have established that the top part of the island is iced firn formed from snow, and that the lower part below the dirt layers is partly ice firn and partly sea ice. Although ice with glacial textures, associated with much morainal material, was found in one area on the

island, the main parts of the island and of the shelf are not believed to be of glacial origin.

In two areas on opposite ends of the island, very heavy dirt layers were exposed at the surface of the ice. Studies of the ice character showed that these exposures resulted from the outcropping of the dirt layer found at 90 feet in the cored hole located between these areas. The weight of this heavy dirt layer was determined from the deposit on the 4.4-square-meter surface of a pit near the outcrop. The weight of the sample of dirt found at 90 feet in the cored hole was extrapolated for comparison with the larger sample and the two weights agreed within the limits of accuracy of extrapolation. The weight of the top dirt layer was also obtained from surface pits. Values for all intermediate dirt layer weights are extrapolated from the weights found in the 3-inch diameter core.

The dirt of the surface layer occurred in globules up to a few inches in diameter located in holes generally 2 to 3 inches below the ice surface. During surface-ice ablation, such as was noted during the two summers at the island, the dirt in the holes melts the ice under it and keeps an approximately constant distance below the ice surface. Thus it is protected from drainage runoff. Some in-

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individual grains remain on the ice surface, giving it a distinct coloration during the melting season. The larger of the dirt layers found below the surface, with the exception of the largest bottom one, also occur in this manner on a smaller scale, with the dirt particles collecting in small balls. These are located as much as 1 inch below a thin zone containing individual dust particles; the zone is noticeable as a discoloration. The dirt in the lower 25 feet of the 90 feet of ice that formed the upper part of the island, although it appeared in patches, did not occur in distinct horizontal layers. This is probably due to the presence of lake ice with elongated vertical crystals, the dirt having settled between the crystal boundaries to various depths. The heavy dirt layer at the bottom was scattered quite unevenly in a zone 2 or 3 inches deep.

Dirt from the various layers is under examination at Dartmouth College (3). The preliminary investigations indicate that all layers contain materials of the same types, detritus from metamorphics and fragments of altered volcanics, with the particle size about that of fine silt. The percentage of heavy minerals was so low that these must have been wind-deposited. Their origin is presumably the low coastal hills of northern Ellesmere Island, which, at the present, are free of snow from about mid-June to late August.

In one area on the island, about 3 miles from the core holes and apart from the areas of heavy dirt and morainal material that we have mentioned, there are deposits of plant material. These have been examined by Polunin (4) who believes that they have for the most part been washed down upon the island from shore areas. His examination of the growth rings in the arctic willow and study of a tuft of moss that was brought back to life have led him to the tentative conclusion that the island broke away

from the shelf sometime after the summer of 1935.

The present interpretation of the dirt layers is that they were formed from annual deposition over the ice surface in approximately equal increments during the entire period of island build-up. During warm cycles of many years duration, these dirt layers accumulate and, by ablation of the ice surface, they also merge with layers that have been deposited in previous colder periods. It seems apparent from Fig. 1 that there have been many such warm cycles since the island was formed. A major period is represented in the lower heavy dirt layer, and another by the top dirt layer; the latter period is still in progress. All through the time represented in the intermediate layers, evidence is present for smaller periods of net ablation. If we assume that the small dirt layers, those weighing less than 0.5 grams per square meter, represent average annual accumulation, there would be at least a few thousand years of accumulation present.

In an attempt to construct a history of island build-up from the individual dirt weights, the carbon-14 dating technique has been utilized. This method, which is well suited to dating over the period of a few thousand years, deals with the carbon material present in the dirt layers, which is found in the form of microscopic spores, fragments of woody tissues, and pollen grains (5). Unfortunately, it has not been possible to collect sufficiently large amounts of the dirt for a good analysis except from locations where it occurs in considerable quantities. However, the method of handling the carbon material in the dating process is undergoing rapid advancements that are making it possible to deal with smaller and smaller samples. The available results of the carbon-14 studies of materials from the ice island are given in Table 1.

There are many difficulties in the interpretation of these dates. Sample 192A, which came from an intermediate dirt layer in the vicinity of the cored holes but which is not included in the table, was the only one in which the material was deposited over a limited number of years and which can be assigned to a definite place in the shelf-building period. Unfortunately, this sample, containing only approximately 1 gram of carbon, was too small to give a reliable age determination. Preliminary results, however, suggest that the layer from which it came might be several thousand rather than several hundred years old. Samples 192B and 213D were the largest and hence most reliable from the standpoint of carbon-14 dating, but both represent an accumulation of many years. Although the accumulation per year may have been fairly uniform, a great deal of the material may have been lost through drainage

Table 1. Results of carbon-14 analysis

Sample No.	Description	Age (yr)
192B	Surface dirt in bottom of drainage lake. Represents a combination of all dirt layers with possibility that much of the top material had been washed away.	5730 \pm 300
192E	Surface grass and debris. Represents top layer in area of much floral material but may not be representative of general top dirt layer.	450 \pm 200
213D	Bottom layer dirt near outcrop. Uncontaminated by surface layer and not subject to drainage loss as sample 192B was.	3050 \pm 200

or other processes, and this loss may have occurred to any part of the accumulation. In addition, the heavy dirt layer may have ablated well into the ice upon which it is resting and in which some salt was present, and it may have picked up marine material of undetermined age. If we assume uniform representation of all years in these samples, the dates given in Table 1 would need to be increased somewhat to be the arithmetical average, for the counting rate varies exponentially with time. There is also the possibility that the soil blown onto the shelf ice carried some "fossil" carbon with it. This could give, at least in the case of sample 192B, an age greater than the time of formation of the dirt layer.

Despite the difficulties in the carbon-14 dating, there is a general agreement in the order of age as determined by this method with that deduced from the total weights of dirt and possible annual accretion, both of which indicate a beginning following the Climatic Optimum or Thermal Maximum, which, according to Ahlmann (6), reached its height about 4000 years ago. Numerous carbon-14 measurements made at the Lamont Geological Observatory on samples from Alaska suggest a major warm period 3500 to 5500 years ago. Whatever amount of ice may have accreted after this warm period, it appears that it was subsequently ablated to the original level, taking with it the dirt layers. The end of this ablation period and start of the accretion represented by the ice still present on the island occurred at a time, indicated by dirt weights alone, about two-thirds to three-quarters of the total island age. Although there is no direct information about this date, it can reasonably be assumed to have occurred 500 to 1000 years ago following the warm period that the Norse settlements in Greenland evi-

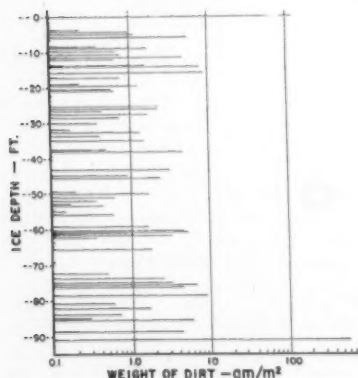


Fig. 1. Depths and weights of dirt layers in a 92-foot hole on T-3.

dence. Then, in the last 200 years or so, there has been another warming-up period that we are still experiencing. Throughout the island history, there must also have been periods of melting and accretion of salty or brackish ice taking place at the lower boundary. These periods may or may not have been parallel with the upper ice history, although the upward heat flow would, of course, increase with decreasing total thickness. Figure 2 shows the change of thickness of the iced firn with accumulated dirt weights, the latter being essentially a time scale. Dotted lines show possible accumulations that have since been ablated.

The significance of this historical record lies in its future climatic implications. During the period in which the 90 feet of ice accumulated on the island, the ice of the entire Arctic basin, including shore areas along the high-altitude land mass, must also have attained considerable thickness. The snow cover noted on T-3 in 1952, 1953, and 1954 amounted to from 1.5 to 1.7 feet. This amount is also typical of northern Ellesmere. As the ice pack became thicker, it was able to withstand the pressures of the wind that tended to hummock it to great heights. In time, the surface must have leveled off considerably. The reduction in surface roughness decreased the wind drag and lessened the ice movements caused by winds and permanent currents. The result of this process was a smaller loss of ice to the Greenland Sea each year. Even today, the ice that flows through this entrance to the Atlantic Ocean is mostly derived from the eastern hemisphere part of the basin. A few hundred years ago the general accretion

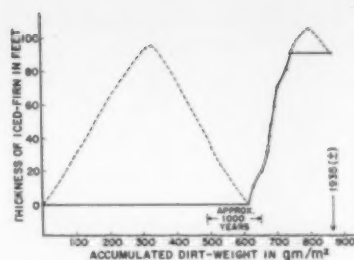


Fig. 2. History of iced-firn accumulation.

period stopped and the present period of ablation began. Little by little, the percentage of heavy ice in the Arctic basin decreased.

The earlier Arctic explorers often wrote of the thick "paleocrystic" ice that is rarely seen today in an ocean where the ice is 6 to 12 feet thick and probably less than 20 years old. Storkerson spent the summer of 1918 on an ice flow in the Beaufort Sea that he estimated to be 50 feet thick (7). This, probably, was sea ice rather than shelf ice or a surface dirt layer would have been noticed. At present, there is probably little left of older ice except that along the shore, which is itself breaking up under the forces of a faster-moving ice pack and the increased tides and storm effects that accompany the thinner ice pack.

Although it would appear from Fig. 2 that 90 feet must be ablated from the island before we can approach the conditions prevailing a thousand years ago, it must be pointed out that however mild the temperatures may have been at that time, the ice shelf survived and is not

surviving the present period. We can only infer that either the ice shelf is thinner now or that the disrupting forces are greater, or both. These disrupting forces are excessive vertical movements of tidal or storm origin, which would increase in frequency with decreasing pack ice thickness. The implications in either case are that the ice is thinner at the present than ever before in historical times.

The ice along the shores of the high-latitude land masses such as Ellesmere Island and Greenland should be the first to form in a cold period following an open polar sea and should be the last to melt as we approach the conditions of the open polar sea. The evidence given here would indicate that we are approaching such a period again. The far-reaching effects of such a possibility warrant further efforts for the collection of more evidence in the other floating islands and in the shelf and high-latitude glaciers of Ellesmere Island and Greenland (8).

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Traveling High-School Science Libraries

Hilary J. Deason

The AAAS Traveling High School Science Library Program, made possible by a grant from the National Science Foundation, began operation in October, when the first unit of the libraries arrived at each of the 66 high schools selected for the experiment. Announcements of the program and its objectives were made in *Science* [122, 190 (29 July

1955)] and in *The Scientific Monthly* [81, 159 (Sept. 1955)]. The program was organized with assistance from the U.S. Office of Education and the National Education Association and its affiliated organizations.

The general purposes of the project are to stimulate interest in reading science books, to broaden the science back-

ground of high-school students, and to assist students with scientific interests in choosing a career.

The books, which number 150, are divided into six units of 25, each fitted into an attractive case that serves both for display in the school libraries and for shipping the books from school to school. The cases, bearing a display poster on the inside of the raised front cover, are shown in Fig. 1. Each school retains a unit for 4 to 5 weeks while classes are in session; thus, by 15 May 1956, all six units will have been used by the students and teachers at the 66 schools.

The 150 books were selected with the assistance of more than 250 scientists, science teachers, and librarians from a long preliminary list that was compiled from various sources. The 150 volumes are included in each of the 12 libraries;

Dr. Deason is director of the AAAS Traveling High School Science Library Program.

11 libraries are circulating to schools and one is being used for display at meetings of national organizations. Most of the books can be read and understood by anyone with a limited knowledge of mathematics and little or no science background. A very few books may constitute a challenge to the superior high-school student.

As previously mentioned, the program is experimental. A portion of the experiment will be an evaluation of the popularity and suitability of the books for general high-school reading; the evaluation will be based, in part, on a study of the actual circulation records at the 66 schools. There are already indications that some important books were not included and that a few of the books chosen may have been poor selections. These mistakes are regretted and are due to the short time available (July to October) in which to organize the program and place it in operation.

The matter of recommending a list of science books suitable for acquisition by all high-school libraries will continue to be studied by the AAAS during the operation of the traveling library program. The publication of such a recommended list is envisioned as a future undertaking in which the cooperation of all interested persons and organizations is solicited.

The list of books in the libraries follows.

Books in the Libraries

- Alter, D., and C. H. Clemmshaw. *Pictorial Astronomy*. Crowell, 1952.
- Andrews, R. C. *Beyond Adventure: The Lives of Three Explorers*. Duell, Sloan and Pearce, 1954.
- Andrews, R. C. *This Amazing Planet*. Putnam's, 1940.
- Armitage, A. *Sun, Stand Thou Still: The Life and Work of Copernicus the Astronomer*. Schuman, 1947.
- Baitsell, G. A. (Ed.) *Science in Progress*. Yale Univ. 1st ser., 1939; 4th ser., 1945; 5th ser., 1947; 6th ser., 1949; 7th ser., 1951; 8th ser., 1953.
- Bakst, A. *Mathematics: Its Magic and Mastery*. Van Nostrand, 1952.
- Ball, M. W. *This Fascinating Oil Business*. Bobbs-Merrill, 1940.
- Bates, M. *The Nature of Natural History*. Scribner's, 1954.
- Bates, M. *The Prevalence of People*. Scribner's, 1955.
- Beebe, W. *Half Mile Down*. Duell, Sloan and Pearce, 1951.
- Benedict, R. *The Chrysanthemum and the Sword*. Houghton Mifflin, 1946.
- Berrill, N. J. *Journey into Wonder*. Dodd, Mead, 1952.
- Berrill N. J. *Sex and the Nature of Things*. Dodd, Mead, 1953.
- Borek, E. *Man, The Chemical Machine*. Columbia Univ., 1952.
- Bremner, M. D. K. *The Story of Dentistry*. Dental Items of Interest, 1954.
- Brinton, C. *Ideas and Men: The Story of Western Thought*. Prentice-Hall, 1950.
- Bronowski, J. *The Common Sense of Science*. Harvard Univ., 1955.
- Buchsbaum, R. M. *Animals without Backbones*. Univ. of Chicago, 1948.
- Burnet, Sir M. *Natural History of Infectious Disease*. Cambridge Univ., 1953.
- Carlson, A. J., and V. Johnson. *The Machinery of the Body*. Univ. of Chicago, 1953.
- Carson, R. *The Sea Around Us*. Oxford Univ., 1951.
- Ceram, C. W. *Gods, Graves, and Scholars: The Story of Archaeology*. Knopf, 1954.
- Christensen, C. M. *The Molds and Man*. Univ. of Minnesota, 1951.
- Clapesattle, H. *The Doctors Mayo*. Univ. of Minnesota, 1954.
- Cohen, I. B. *Science, Servant of Man*. Little, Brown, 1948.
- Collis, J. S. *The Triumph of the Tree*. Sloane, 1954.
- Cooley, D. G. *The Science Book of Wonder Drugs*. Franklin Watts, 1954.
- Coombs, C. *Skyrocketing into the Unknown*. Morrow, 1954.
- Courant, R., and H. Robbins. *What is Mathematics?* Oxford Univ., 1941.
- Crombie, A. C. *Augustine to Galileo: The History of Science A.D. 400-1650*. Harvard Univ., 1953.
- Croneis, C., and W. C. Krumbein. *Down to Earth: An Introduction to Geology*. Univ. of Chicago, 1936.
- Curie, E. *Madame Curie*. Doubleday, 1953.
- Dampier, Sir W. *A History of Science and its Relations with Philosophy and Religion*. Cambridge Univ., 1952.
- Dantzig, T. *Number: The Language of Science*. Macmillan, 1954.
- Darwin, C. *The Voyage of the Beagle*. Dutton, 1906.
- Dean, G. *Report on the Atom*. Knopf, 1954.
- de Kruif, P. *Microbe Hunters*. Harcourt, Brace, 1932.
- Desch, H. E. *Timber: Its Structure and Properties*. St. Martin's, 1953.
- Diebold, J. *Automation: The Advent of the Automatic Factory*. Van Nostrand, 1952.
- Ditmars, R. L. *Reptiles of the World*. Macmillan, 1955.
- Douglas, J. S. *The Story of the Oceans*. Dodd, Mead, 1952.
- Dubos, R. J. *Louis Pasteur: Free Lance of Science*. Little, Brown, 1950.
- Dubos, R., and J. Dubos. *The White Plague: Tuberculosis, Man and Society*. Little, Brown, 1952.
- Eaton, J. R. *Beginning Electricity*. Macmillan, 1952.
- Eddington, A. S. *The Nature of the Physical World*. Cambridge University, 1953.
- Fairchild, D. *The World Was My Garden*. Scribner's, 1954.
- Farber, E. *The Evolution of Chemistry*. Ronald, 1952.
- Faxon, N. W. (Ed.) *The Hospital in Contemporary Life*. Harvard Univ., 1949.
- Fenton, C. L., and M. A. Fenton. *Giants of Geology*. Doubleday, 1952.
- Finch, J. K. *Engineering and Western Civilization*. McGraw-Hill, 1951.
- Fleming, D. *William H. Welch and the Rise of Modern Medicine*. Little, Brown, 1954.
- Fox, R. *Great Men of Medicine*. Random House, 1947.
- Fox, R. *Milestones of Medicine*. Random House, 1950.
- Friend, J. N. *Man and the Chemical Elements*. Scribner's, 1953.
- Friend, J. N. *Numbers: Fun and Facts*. Scribner's, 1954.
- Gabrielson, I. N. *Wildlife Conservation*. Macmillan, 1952.
- Gamow, G. *Mr Tompkins Explores the Atom*. Cambridge Univ., 1955.
- Gamow, G. *Mr Tompkins in Wonderland*. Cambridge Univ., 1953.
- Gamow, G. *One, Two, Three . . . Infinity*. Viking, 1954.
- Gamow, G. *The Moon*. Schuman, 1953.
- Garrett, H. E. *Great Experiments in Psychology*. Appleton-Century-Crofts, 1951.
- Gibberd, F. *Town Design*. Reinhold, 1953.
- Glasstone, S. *Sourcebook on Atomic Energy*. Van Nostrand, 1950.
- Grabbe, P. *We Call It Human Nature*. Harper, 1939.
- Gray, J. *How Animals Move*. Cambridge Univ., 1953.
- Grinter, L. E., H. N. Holmes, et al. *Engineering Preview*. Macmillan, 1947.
- Haggard, H. W. *Devils, Drugs, and Doctors*. Harper, 1929.
- Hamilton, W. J., Jr. *American Mammals: Their Lives, Habits and Economic Relations*. McGraw-Hill, 1939.
- Harrow, B. *Casimir Funk: Pioneer in Vitamins and Hormones*. Dodd, Mead, 1955.
- Hegner, R. *Parade of the Animal Kingdom*. Macmillan, 1955.
- Heyerdahl, T. *Kon-Tiki: Across the Pacific by Raft*. Rand McNally, 1950.
- Hodgman, C. C., R. C. Weast, et al. *Handbook of Chemistry and Physics*. Chemical Rubber, 1954.
- Hogben, L. *Mathematics for the Million*. Norton, 1951.
- Hogben, L. *Science for the Citizen*. Norton.
- Holland, R., Jr. *The Physical Nature of Flight*. Norton, 1951.

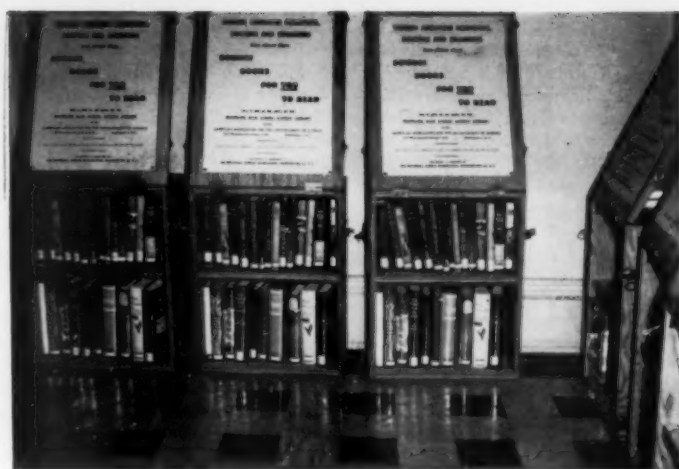


Fig. 1. Units of the traveling high-school science library.

Hooton, E. A. *Up From the Ape*. Macmillan, 1946.

Jaffe, B. *Crucibles: The Story of Chemistry*. Simon and Schuster, 1951.

Jaffe, B. *Men of Science in America*. Simon and Schuster, 1946.

Kaempfert, W. *Explorations in Science*. Viking, 1953.

Kaufert, F. H., and W. H. Cummings. *Forestry and Related Research*. Soc. of American Foresters, 1955.

Kellogg, C. E. *The Soils That Support Us*. Macmillan, 1951.

Kendall, J. *Great Discoveries by Young Chemists*. Crowell, 1953.

Killeffer, D. H. *The Genius of Industrial Research*. Reinhold, 1948.

King, T. *Water: Miracle of Nature*. Macmillan, 1955.

Kraus, E. H., and C. B. Slawson. *Gems and Gem Materials*. McGraw-Hill, 1947.

Kugelmass, J. A. *J. Robert Oppenheimer and the Atomic Story*. Messner, 1953.

Laird, C., and R. Laird. *Weathercasting*. Prentice-Hall, 1955.

Lavine, S. A. *Steinmetz: Maker of Lightning*. Dodd, Mead, 1955.

Levinger, E. E. *Albert Einstein*. Messner, 1949.

Levinger, E. E. *Galileo: First Observer of Marvelous Things*. Messner, 1954.

Lieber, L. R. *The Education of T. C. Mits*. Norton, 1944.

Logsdon, M. I. *A Mathematician Explains*. Univ. of Chicago, 1947.

Lull, R. S. *Organic Evolution*. Macmillan, 1945.

MacCurdy, E. (Ed. and Tr.) *The Notebooks of Leonardo da Vinci*. Braziller, 1955.

Macgowan, K. *Early Man in the New World*. Macmillan, 1953.

MacMillan, M. *Green Seas and White Ice*. Dodd, Mead, 1948.

Menzel, D. H. *Our Sun*. Blakiston, 1950.

Morris, L., and K. Smith. *Ceiling Unlimited: The Story of American Aviation from Kitty Hawk to Supersonics*. Macmillan, 1953.

Moulton, F. R., and J. J. Schifferes. *The Autobiography of Science*. Doubleday, 1953.

Munn, N. L. *The Evolution and Growth of Human Behavior*. Houghton Mifflin, 1955.

Murchie, G., Jr. *Song of the Sky*. Houghton Mifflin, 1954.

Nakaya, U. *Snow Crystals, Natural and Artificial*. Harvard University, 1954.

Norman, J. R. *A History of Fishes*. Wyn, 1948.

Oehser, P. H. *Sons of Science: The Story of the Smithsonian Institution and its Leaders*. Schuman, 1949.

Payne-Gaposchkin, C. *Stars in the Making*. Harvard Univ., 1952.

Peattie, D. C. *Flowering Earth*. Putnam's, 1939.

Reid, C. *From Zero to Infinity*. Crowell, 1955.

Riegel, E. R. *Industrial Chemistry*. Reinhold, 1949.

Robinson, M. L. *Runner of the Mountain Tops: The Life of Louis Agassiz*. Random House, 1939.

Roe, A. *The Making of a Scientist*. Dodd, Mead, 1953.

Rogers, B. A. *The Nature of Metals*. Iowa State Coll., 1951.

Roueché, B. *Eleven Blue Men, and Other Narratives of Medical Detection*. Little, Brown, 1954.

Schück, H., R. Sohlman, et al. *Nobel: The Man and His Prizes*. Univ. of Oklahoma, 1951.

Seton, E. T. *Trail of an Artist Naturalist*. Scribner's, 1948.

Shapley, H. (Ed.) *Climatic Change: Evidence, Causes, and Effects*. Harvard Univ., 1953.

Shapley, H., S. Rapport, and H. Wright. *A Treasury of Science*. Harper, 1954.

Shaw, Sir N. *The Drama of Weather*. Cambridge Univ., 1940.

Silverman, M. *Magic in a Bottle*. Macmillan, 1953.

Simpson, G. G. *Life of the Past: An Introduction to Palaeontology*. Yale Univ., 1953.

Singer, C. *A History of Biology*. Schuman, 1951.

Slaughter, F. G. *Immortal Magyar: Semmelweis, Conqueror of Childbed Fever*. Schuman, 1950.

Sloop, M. T. M. *Miracle in the Hills*. McGraw-Hill, 1953.

Smart, W. M. *The Origin of the Earth*. Cambridge Univ., 1953.

Smith, F. G. W., and H. Chapin. *The Sun, the Sea and Tomorrow*. Scribner's, 1954.

Sootin, H. *Isaac Newton*. Messner, 1955.

Sootin, H. *Michael Faraday: From Errand Boy to Master Physicist*. Messner, 1954.

Spencer, S. M. *Wonders of Modern Medicine*. McGraw-Hill, 1953.

Sprout, E. E. *The Science Book of the Human Body*. Franklin Watts, 1955.

Storck, J., and W. D. Teague. *Flour for Man's Bread: A History of Milling*. Univ. of Minnesota, 1952.

Sullivan, J. W. W. *The Story of Metals*. Iowa State Coll., 1951.

Taylor, F. S. *A Short History of Science and Scientific Thought*. Norton, 1949.

Teale, E. W. *Grassroot Jungles: A Book of Insects*. Dodd, Mead, 1950.

Teale, E. W. *North with the Spring*. Dodd, Mead, 1951.

Teale, E. W. (Ed.) *The Insect World of J. Henri Fabre*. Dodd, Mead, 1950.

Tunnard, C., and H. H. Reed. *American Skyline*. Houghton Mifflin, 1955.

U. S. Dept. of Agriculture. *Insects: The Yearbook of Agriculture*. U.S. Govt. Printing Office, 1952.

U. S. Dept. of Agriculture. *Plant Diseases: The Yearbook of Agriculture*. U.S. Govt. Printing Office, 1953.

U. S. Dept. of Agriculture. *Trees: The Yearbook of Agriculture*. U.S. Govt. Printing Office, 1949.

von Frisch, K. *The Dancing Bees*. Harcourt, Brace, 1955.

Walker, K. *The Story of Medicine*. Oxford Univ., 1955.

Wallace, G. J. *An Introduction to Ornithology*. Macmillan, 1955.

White, A. T. *Lost Worlds: The Romance of Archaeology*. Random House, 1941.

Williams, B., and S. Epstein. *William*

Crawford Gorgas: Tropic Fever Fighter. Messner, 1953.

Woodham-Smith, C. *Lonely Crusader: The Life of Florence Nightingale.* McGraw-Hill, 1951.

Zinsser, H. *Rats, Lice and History: A Study in Biography.* Little, Brown, 1935.

Schools in the Program

The greatest apparent need for the science books of the traveling libraries is in the smaller high schools located in communities with poor library facilities. Therefore the participating schools were chosen from those with an enrollment of approximately 200 to 350 students in the ninth to 12th grades, inclusive. The schools were selected from recommendations of state departments of education and members of college and university faculties in a given area who had a knowledge of the high schools and of their library and science-teaching facilities. Each school so recommended was informed of the program and its objectives and was invited to indicate its interest in becoming a part of the program. From the replies received, 66 schools representing a diversity of local socioeconomic conditions and a wide geographic distribution were selected. The list of schools follows.

California: Davis Joint Union High School; Live Oak Union High School; Patterson Union High School; Strath-

more Union High School; Sutter Union High School; Weed High School.

Georgia: Cuthbert High School; Fort Valley High School; Manchester High School; Nahunta High School; Ocilla High and Industrial School; Quitman High School.

Indiana: Delphi-Deercreek Township Consolidated School, Delphi; Mooresville High School; Morgan Township School, Valparaiso; Morocco High School; Northwestern High School, Kokomo; Pendleton High School.

Kansas: Atchison County Community High School, Effingham; Buhler Rural High School; Caney High School; Grant County Rural High School, Ulysses; Kingman High School; Neodesha High School.

Kentucky: Campbellsville High School; Harrodsburg High School; Richmond High School; Rosenwald High School, Harlan; Shepherdsville High School; Wolfe County High School, Campton.

Massachusetts: Weston High School; Ipswich High School.

Nebraska: Blair High School; Crete High School; Gordon High School; Ogallala High School; Superior High School; Valentine High School.

New York: Bemus Point High School; Canajoharie Central School; Cassadaga Valley Central School, Sinclairville; Geneseo Central School.

Oregon: Creswell Union High School; Elmira Union High School; Estacada Union High School; Oakridge High

School; Rainier Union High School; Stayton Union High School.

South Dakota: Custer High School; Gregory High School; Central High School, Madison; Sisseton High School; Webster High School; Winner Public Schools.

Tennessee: Alcoa High School; Castle Heights Military Academy, Lebanon; Catholic High School for Boys, Memphis; Ducktown High School; Norris High School; Powell Valley High School, Speedwell.

Wisconsin: Adams-Friendship High School, Adams; Brodhead High School; Central High School, Salem; Hudson High School; Markesan High School; Phillips High School.

Comments and Suggestions Invited

The AAAS requests interested persons to submit their comments and suggestions concerning the Traveling High School Science Library Program in general, to offer their personal evaluations of any books in the list, and to suggest appropriate books currently in print which they would recommend as substitutes or additions. Such observations will assist in perfecting the proposed book list that was mentioned previously and in making substitutions of books in the libraries if means should become available for continuing the program beyond the present school year.

R. E. Himstead, Champion of Academic Freedom

Ralph E. Himstead had a passion for freedom and a passion for integrity. To these, particularly in the academic profession, he devoted a vigorous mind and, until shortly before his death, a vigorous physique.

Himstead was born 31 January 1893, at Blue Mound, Illinois. He received his A.B. from the University of Illinois and his legal education at Northwestern University and Harvard University. After finishing his undergraduate work, but before he completed his legal training, he

taught public speaking and political science at Cornell College; and for 12 years, before he became general secretary of the American Association of University Professors in 1936, he was on the faculty of the Law School at Syracuse University.

In 1935 the American Association of University Professors published a report on the status of academic freedom at the University of Pittsburgh. Himstead was the chairman of the investigating committee. The thoroughness, the courage,

and the judicious nature of this report were at once recognized; and it was clear that Himstead had taken a place of leadership in the profession. In 1936 Himstead was elected to succeed Henry W. Tyler, who for many years had served as secretary of the A.A.U.P. A year later he also followed Tyler as editor of the *Bulletin* of the association. He held both of these offices until his death on 9 June 1955, although he had submitted his resignation as secretary a year earlier, hoping to devote all of his energies to the *Bulletin* after the election of his successor. These 19 years as the chief officer of the A.A.U.P. formed a period of great usefulness. Among many activities I mention four:

1) Himstead carried forward with vigor the work of Committee "A" (Academic Freedom and Tenure). A very large proportion of this work deals with cases of individual professors who believe that their freedom as a scholar has been impaired or that their tenure as a faculty member has been unjustly terminated. Some of these cases are settled by mutual agreement between the individual and the administration of the college, often

after considerable work on the part of the secretary. Some of these claims, upon preliminary investigation, turn out to have little merit. Others require careful investigation by special committees, sometimes revealing conditions that make it wise to publish the reports of the committees. Himstead worked on all types. His courage in the face of the administrations which he believed to be behaving in ways prejudicial to American education and which he believed must be publicly criticized was matched by his courage under pressure from irate faculty members whom he believed to be at fault. His honesty in forming opinions was patent to all who worked with him. His legal training and talent guided many committees to more judicious judgments and sometimes protected them from making statements that could have involved their members and the association in legal difficulties. His work on Committee "A" was, of course, frequently criticized since most cases could have been avoided by common sense (frequently common sense on one side alone would have been enough); and hence wise analysis was resented, usually by one, often by both, parties. Courage, honesty, and the power of judicial analysis were needed. These Himstead had. As cases accumulated, especially those involving charges of subversion and disloyalty, the ability to delegate was also needed. Delegation Himstead found difficult, and his health broke under the strain of trying to do the work of three men and succeeding only in doing the work of two.

2) The *Bulletin* of the American Association of University Professors, under Himstead's editorship, grew in influence, circulation, and size. He had an eye for the significant and the readable.

3) Himstead was a member of the joint commission of the Association of American Colleges and the American

Association of University Professors on retirement problems. He approached these problems with four firm convictions. First, compensation in the academic profession is so low that the retirement provisions of an institution must be considered the major factor in the provision for the period after retirement and should be more adequate than they generally were at the time the report was made (report published in March 1950). Second, men can work longer than most retirement systems contemplate; and ceasing to work is not good for the healthy. Hence, retirement ages should, in general, be later than they are at most institutions. Third, the best type and place of work for a healthy person is the type in which he is already expert and in surroundings he is used to. Finally, Himstead believed that the method of retiring individuals must not afford too great administrative discretion, for then it can be used as a pressure to curtail the scholar's freedom. It is my belief this report is of real use to the profession and that Himstead's contribution was material.

4) Himstead was a representative of the A.A.U.P. on the joint commission with the A.A.C. that led to the 1940 Statement on Academic Freedom and Tenure. It was clear from the start that with such members, among others, as Meta Glass, Samuel Capen, and Henry Wriston for the A.A.C. and A. J. Carlson, W. W. Cook, and Himstead for the A.A.U.P., the commission would either produce something worthwhile and forthright or end in a deadlock. Sometimes the latter seemed probable. The former resulted. If occasionally Himstead was cantankerous, he had ample company. It is my belief that this statement has had great influence and, although the commission was not one to be dominated by any individual, all would recognize that Himstead's part was of great significance.

Himstead lived in the midst of controversy and hence of criticism. It would be foolish to depict him as an archangel. It is a part of friendship to recognize his human weaknesses so as to make more clear his accomplishments, character, and ability. His characteristic faults as an officer—a magnificent officer—of the A.A.U.P. were his tendencies to take too seriously even trivial criticism and his difficulty in delegating work. Sometimes, especially at national meetings, one felt that he believed all criticism must be answered and that he must do the answering. Many duties fall upon the secretary of an organization that should not fall upon the secretary himself. A somewhat less adequate piece of work done promptly is often better than an excellent job performed later. I do not know if Himstead would have agreed to this dictum intellectually. He certainly would not have emotionally.

His complete honesty in individual cases constantly overcame his prejudices. Yet it was true that he always seemed surprised at unreasonableness in a professor, but the same trait appeared to him a law of nature in the administration.

One sometimes forgets how much scientists in recent days have been helped by the tradition of academic freedom and by the acceptance of certain basic principles by our universities. If we were to select a small group of men who in the past 25 years have done the most to build those traditions and gain acceptance for those principles, Himstead would be among them. Science owes much to this warm-hearted, devoted, very human yet intellectually honest lawyer. Those of us who have been privileged to work closely with Ralph Himstead have known a friend.

MARK H. INGRAHAM

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*How far even then mathematics will suffice to describe, and physics to explain, the fabric of the body, no man can foresee. It may be that all the laws of energy, and all the properties of matter, and all the chemistry of all the colloids are as powerless to explain the body as they are impotent to comprehend the soul. For my part, I think it is not so. Of how it is that the soul informs the body, physical science teaches me nothing; and that living matter influences and is influenced by mind is a mystery without a clue. Consciousness is not explained to my comprehension by all the nerve-paths and neurones of the physiologist; nor do I ask of physics how goodness shines in one man's face, and evil betrays itself in another. But of the construction and growth and working of the body, as of all else that is of the earth earthy, physical science is, in my humble opinion, our only teacher and guide.—D'ARCY WENTWORTH THOMPSON, *On Growth and Form*.*

News of Science

Radioactive Fallout in the Marshall Islands

An article on radioactive fallout effects in the Marshall Islands appeared in the November issue of *Research Reviews*, a publication of the Office of Naval Research. The Japanese fishermen who were dusted on 1 Mar. 1954 as the result of a nuclear test in the Pacific have been widely discussed, but it is not so well known that there was another group of victims. The report in *Research Reviews* is based on an interview with Robert A. Conard of the Naval Medical Research Institute, Bethesda, Md., who was a member of the medical team that was assigned to care for the persons who had been exposed.

Within 36 hours of the time the incident was reported in Washington, a team from the hematology department of NMRI had assembled 2 tons of equipment and was on its way to Kwajalein, evacuation center for 239 inhabitants of four Marshall Islands and for 28 American servicemen who had been serving at a weather station. From the beginning, intensive medical histories were kept on all the people who had been dusted. Not only did the medical staff members record such routine information as temperature, appetite, and so forth, but they embarked on a whole series of special tests. It was important to find out as soon as possible the extent of the radiation each patient had received.

The 64 people on the island of Rongelap, where the fallout was said to be like snow, were the worst affected—they absorbed an average of 175 roentgens each (400 roentgens is believed to be a dose that will kill 50 percent of any group exposed). A group of 18 members of the Rongelap community happened to be away on a fishing trip. They were on Ailinginae, where the fallout was described as "mist," and they escaped with an average exposure of 69 roentgens.

The largest island group, the 157 inhabitants of Utrik, received the lightest dose, an average of 14 roentgens. The population of Utrik was unaware of anything unusual in the atmosphere.

The American servicemen, who had been posted on an uninhabited island, also received a dose that was consider-

ably less than lethal, and they, too, described the fallout as mist. Because they were more aware of the harmful effects of the fallout, the members of this group washed and were otherwise careful. As a result they received only minor lesions and in 6 months all had returned to duty or to civilian life.

The physicians in charge of the treatment program selected control groups of inhabitants from islands that had not received fallout. These afforded a basis for comparison. The amount of the whitish powder that the inhabitants collected on their persons varied, and in some cases they went swimming or otherwise washed off the dust. The custom of dressing hair with a heavy coconut oil increased contamination of the head and added to difficulties later. In addition; dust fell in the open cisterns that are used to store drinking water. Some of the food that was eaten also had picked up dust. The woven mat houses of the area were readily penetrated by the dust; and thus practically everyone down to the tiniest babies was irradiated.

Thorough tests were made of dust from all four islands. The pulverized coral particles emitted both beta and gamma radiation. The proportion of beta was much higher, but in the case of the Rongelap people the gamma radiation was sufficient to bring about, during the first 10 days, some of the known symptoms of radiation sickness. During the first 2 days, about three-quarters of the people became nauseated and a few vomited and had diarrhea. Many complained of itching and burning of the skin. However these symptoms had subsided by the time the evacuees arrived in Kwajalein.

The skin sores and loss of hair (brought on by beta radiation) developed beginning about 2 weeks after the accident and affected the children more than the adults. There were many cases of painful skin ulcers, particularly in the group of 64 from Rongelap who had suffered the most exposure. Those parts of the body covered by clothing had few or no skin lesions.

Sores showed a tendency to develop in normally sweaty places. There were quite a few cases of sore places on the top of feet and between the toes, but

none on the soles of the feet although the natives had walked around in the dust and probably had more contact on the soles of their feet than they did anywhere else. Apparently the soles of the feet were too thick for penetration of much beta radiation.

The skin lesions were the most obvious ill effect, and in some cases these lesions were painful. A number of the deeper lesions healed without a return of normal pigmentation; instead, there are white splotches. These are being carefully checked to see if there might be a tendency for the soreness to recur. So far, such a tendency has not been detected.

The medical team was confronted with a problem when the blood count on white corpuscles dropped and there was a depression in the blood platelets. The outbreak of an epidemic of colds along with the severe skin lesions made the evaluation of prophylactic therapy critical. During this time of crisis, a decision had to be made as to the use of antibiotics as a general treatment.

Because the state of health of most of those affected could not be correlated with the degree of depression of the blood cells in individual cases, antibiotics were not used except in a few instances in which the patient had some ailment not connected with the fallout. Children continued to have measles, and the incidence of tonsillitis was about the same as in the control population.

The one chronic diabetic, a mature man, continued with his health about the same. An elderly woman, said to be 100 years old, thrived and is still alive. In fact, no one has died in the 18 months since the accident occurred.

A small amount of fallout was absorbed internally with food and water, but the amount has been calculated to be too small to be harmful. Four women who were pregnant at the time of the accident all had their babies normally, and with no evidence of trouble for the baby in the future. Several of the women have become pregnant again, and their medical records are satisfactory.

Exposed chickens and pigs have been examined. Pigs from Rongelap show evidence of internal irradiation ten times as great as the dose received by the human population. However, as in the case of the pig from the Bikini tests, they seemed to be doing well. When these animals die they are thoroughly examined for radiation effects.

After 3 months, and when they were progressing satisfactorily, the evacuees were moved from the hospital grounds at Kwajalein to a location on the island of Majuro in the southern Marshalls. There they have returned to more or less normal living, with the exception that food and other supplies are pro-

vided. A number of relatives from the island groups have come to Majuro to live with their kin.

While the physicians who are caring for the islanders have reported that at the end of 1 year there are no continuing ill effects from the fallout, the checks on their condition will be continued for many months, or perhaps years to come. Eventually the people will all be returned, if they so desire, to their native islands, but in the meantime the Atomic Energy Commission and the Navy are both thoroughly inspecting the habitats to make sure there will be no hazards from anything—vegetation, water, or dwellings—that might contain lingering radiation.

Asian Wildlife Conservation

Ecological studies are one answer to preservation of threatened species, according to Lee M. Talbot of the University of California, who recently traveled through 30 countries of the Middle East and South and Southeast Asia on a 6-month mission for the Survival Service of the International Union for the Protection of Nature. Purpose of the trip was to survey the present status of some of the world's rarest animals and to determine how the IUPN can best cooperate with local authorities in wildlife conservation measures. Data were obtained through discussions with conservationists, scientists, and government leaders and from expeditions into the remote habitats of some of the animals that are threatened.

Talbot's visits and expeditions were generally arranged by the host governments. He was encouraged by the interest in wildlife problems exhibited by the governments of India, Burma, Malaya, and Indonesia, and by their invaluable cooperation with the IUPN survey project.

India, for example, has established a country-wide Indian Board for Wildlife, and subsequently, individual state boards. The country has the last surviving specimens of the Asian lion. Under government protection their population has increased from less than a dozen individuals in 1900 to nearly 300 this year. Although the lions are protected from most hunting, their habitat in the Gir Forest in northwest India has been reduced by about 50 percent in the last 50 years by overgrazing and subsequent encroachment of agriculture. Since the wild-game food supply has been diminished by hunting and by competition with domestic stock, the lions now kill an estimated 10 cattle a day.

Approximately 300 great Indian rhinoceros survive in India's wildlife reserves in Assam and Bengal. An unknown

number still exist in the Terai area of Nepal, where nearly 100 specimens were reported killed last year.

The last Javan rhinoceros are located in the Ujung Julon Reserve in western Java. These 20 to 40 animals, and a rich variety of other Javan wildlife, are protected by the newly formed Nature Protection Department of the Indonesian Forest Service.

This interest of these governments in wildlife conservation has generally originated with scattered individuals—for example, E. P. Gee in Assam and A. Hoogerwerf in Java. Through their studies and writings, such men have brought the conservation problem to the attention of their governments and to some segments of the public. However, Talbot stresses that throughout South and Southeast Asia there is no widespread conservation consciousness, that there are virtually no trained wildlife technicians, and that practically nothing is known of the ecology of the principal animal species.

Based on the findings of the study, Talbot has made the following proposals to IUPN to meet the immediate needs for preservation of threatened species and for general wildlife conservation:

- 1) To educate and stimulate wide general interest, the publication of an illustrated children's textbook giving a simplified introduction to conservation.
- 2) The appointment of a wildlife adviser who would be available to governments that request his services to fulfill the immediate need for a technical approach to the problems of wildlife and the establishment of park areas.
- 3) The establishment of a program to assist the authorities in these countries to set up their own wildlife technician training organizations.
- 4) The conduct of ecological studies of the principal animal species in order to obtain the necessary data on which to base effective management programs.

Persons interested in the work of the IUPN are encouraged to write to the secretary general at the union's new address: 31 Rue Vautier, Brussels, Belgium.

News Briefs

■ The first international training course for health physicists opened last month at the Karolinska Hospital, Stockholm, Sweden. It was organized by the Government of Sweden and the World Health Organization Regional Office for Europe in cooperation with the national atomic energy agencies of various countries, including the United States.

The 5-week program is being directed by Elda E. Anderson of Oak Ridge National Laboratory. Lecturers are drawn from the United Kingdom and France.

Participants in the course represent Belgium, Denmark, France, Federal Republic of Germany, Iceland, Italy, the Netherlands, Norway, Sweden, and Switzerland.

This course is intended particularly for physicists in European countries where atomic energy programs are now in a rapid and comparatively early stage of development. The course also provides for an exchange of experience among countries where research workers have been concentrating on different aspects of radiation protection.

The Stockholm program arises directly out of the Geneva Conference on the Peaceful Uses of Atomic Energy and was endorsed by government delegates at the meeting of the WHO Regional Committee for Europe in Vienna.

■ The announcement of the latest Soviet nuclear explosion on 26 November contained more detail than past announcements, which have been limited to a few words, one or two sentences at most. The text of the Soviet statement follows:

"Recently, in connection with the plan for scientific research and experimental work in the field of atomic energy, tests of new types of atomic and thermonuclear [hydrogen] weapons have been carried out in the Soviet Union.

"The tests fully justified the corresponding scientific and technical calculations, showing the important new achievements of Soviet scientists and engineers. The last explosion of a hydrogen bomb was the most powerful of all explosions carried out until now.

"In the interests of avoiding radioactive 'fall out' the explosion was carried out at a great height. At the same time wide research was conducted on questions of the defense of peoples.

"In connection with the fact that clamor has been raised in certain Western countries over the above-mentioned tests in the U.S.S.R., Tass is authorized to state the following:

"The Soviet Government has stood and does stand for the prohibition of atomic and thermonuclear weapons with the establishment of effective international control.

"Such a decision would permit the use of atomic energy to be directed toward exclusively peaceful aims. Proposals for the unconditional prohibition of atomic and the thermonuclear weapons were made by the Soviet Union both in the United Nations organization and at the recent conference of the four powers' foreign ministers in Geneva, but were not accepted. The Soviet Union also submitted a proposal for the moral and political condemnation of atomic and hydrogen weapons.

"The Western powers also refused to accept this proposal.

"Carrying out the above-mentioned tests in the interests of guaranteeing her security, the Soviet Union will continue to strive for agreement in the United Nations organization on the prohibition of atomic and hydrogen weapons and on the reduction of all other types of armaments, on the further reduction of international tension and the establishment of confidence between states, as well as the support and consolidation of the peace generally."

■ New Zealand authorities report that two prospectors, Frederick Cassin of Wellington and Charles Jacobsen of Picton, have made the country's first uranium strike on the west coast of South Island. The find has been described as "quite significant" by R. W. Willett, senior geologist of the New Zealand Department of Scientific and Industrial Research. The exact proportion of uranium present in the ore submitted for analysis has not yet been determined.

Scientists in the News

CLIFFORD C. FURNAS, chancellor of the University of Buffalo, was appointed by President Eisenhower on 22 Nov. to be Assistant Secretary of Defense for Research and Development. He succeeds Donald A. Quarles, who became Secretary of the Air Force on 17 Aug. Furnas has taken leave of absence from the university from 1 Dec. 1955 to 1 Feb. 1957.

VLADIMIR P. LOUKINE of the Soviet Machinery Construction Ministry and GEORGI P. KAZANSKI of the Radiotechnical Collegium toured the United States during the last 2 weeks of November. Their trip was made under the joint sponsorship of the State Department and the American Society of Mechanical Engineers. Loukine is an authority on automation and Kazanski is an electronics specialist.

The Soviet visitors, who arrived on 14 Nov., attended the International Automation Exhibition in Chicago. While in that city, they also saw the Lakeside Press, electric power production equipment at the Commonwealth Edison Company, installations of the Illinois Central Railroad, and automatic slaughtering machinery at Armour and Company.

During their stay in Washington, D.C., the two engineers—who were accompanied on their tour by a State Department interpreter, a representative of the Soviet Embassy, and a member of the Society of Mechanical Engineers—were received at the National Academy of Sciences; they also inspected a microwave relay station of the American Tele-

phone and Telegraph Company. Then they proceeded to New York, where they visited the headquarters of the Institute of Radio Engineers and the White Plains terminal of the Tennessee Gas Transmission Company.

During conversations with American experts the Soviet scientists gave the impression that the Soviet Union was advanced in the design and production of automation equipment but that it was behind the United States in widespread application of automatic industrial controls.

Another group of visitors, the first trade delegation to come here from one of the Soviet satellites, arrived from Romania on 27 Nov. for a 25-day stay. The delegation is composed of VIRGIL GLIGOR, Deputy Minister of Agriculture; GRIGORE OBREJEANU, professor of plant genetics at the University of Bucharest, and SILVIU BRUCAN, a member of the Romanian National Assembly and a newspaper man on the staff of *Scinteia*, the official Communist organ in Romania.

The men, who are guests of the Garst and Thomas Hybrid Corn Company of Coon Rapids, Ia., are here specifically to buy hybrid corn and the machinery to plant, cultivate, and harvest it, but the men indicated that they hoped to pave the way for extensive exchanges in the future. The group is prepared to spend \$500,000 to \$1 million for seed and for ten sets of related machinery.

Romania has been a great corn producer for 250 years, according to Geza Schute, an official of Garst and Thomas who went to the U.S.S.R. and Romania last fall. He said that in Romania yield per acre of ear corn is not quite as high as it is on comparable land here, but that the Romanians manage to grow a little more silage corn per acre than farmers in the United States.

LEON WARREN has left the National Academy of Sciences—National Research Council after 4½ years as professional associate on the staff of the Division of Medical Sciences. He joined the clinical investigation department of Parke, Davis and Company, Detroit, Mich., on 1 Dec. At the academy Warren was responsible for the activities of the main Committee on Medicine and Surgery and for six of the specialized advisory groups of the medical science division, as well as for the Symposium on Atherosclerosis that was held in 1954.

C. H. ANDREWES, deputy director of the National Institute for Medical Research, Great Britain, and head of the World Health Organization Influenza Centre, Mill Hill, London, spoke on "The evolution of viruses" on 7 Dec. at the Naval Medical Research Institute.

JOHN C. WHITEHORN, professor of psychiatry at Johns Hopkins University, delivered the Thomas William Salmon lectures of the New York Academy of Medicine on 30 Nov. In the two lectures—one afternoon, one evening—Whitehorn discussed "Psychiatric education and progress."

PAUL P. EWALD, Thomas Potts professor of physics and head of the department of physics at the Polytechnic Institute of Brooklyn, has been elected an honorary member of the Société Française de Minéralogie et de Cristallographie. There are only eight men living who have been elected to honorary membership by this French society, which was founded more than 75 years ago.

RALPH W. MACY, formerly chairman of the department of biology at Reed College, has been appointed professor of biology at Portland State College. The college was established on 3 Aug. in Portland, Ore., as a 4-year college within the Oregon State System of Higher Education. There was an initial enrollment of 2800 students.

EDWARD C. BULLARD, director of the National Physical Laboratories, Teddington, England, delivered a public lecture at Massachusetts Institute of Technology on 10 Nov. His lecture, which was given under the auspices of the department of geology and geophysics, was on "Material of the interior of the earth."

JOHN W. A. BRANT, formerly agricultural officer of the Food and Agriculture Organization of the United Nations (1953–1955), is now in Guayaquil, Ecuador, as specialist of the Universidad de Guayaquil y Universidad de Idaho en Programa Cooperativo para el Progreso de las Ciencias Agropecuarias. On 18 Nov. he was honored by nomination to professor, Facultad de Agronomía y Veterinaria. He has launched a research program in poultry nutrition that is to be continued concurrently with research programs in animal physiology and genetics.

DAVID W. CUGELL has been appointed to direct new research laboratories at Northwestern University for the study of diseases of the lungs, heart, kidneys, and blood vessels. Before joining Northwestern, he headed the pulmonary physiology laboratory at the Thorndike Memorial Laboratory, Boston City Hospital, and was an American Heart Association research fellow in medicine at Harvard Medical School.

The new laboratories, now being constructed and equipped, will expand the

research and teaching facilities of the Florsheim Cardiac Clinic, which was established in 1938. The clinic will move into larger quarters that will provide additional laboratories, examination and treatment rooms, and provisions for nursing care and social service. It will be on the third floor of the Montgomery Ward Memorial Building at Northwestern University Medical Center in Chicago.

Necrology

ISAAC A. ABT, Chicago, Ill.; 87; professor emeritus of pediatrics at the Northwestern University Medical School, Chicago, Ill.; 22 Nov.

ANDREW J. AKELAITIS, Pelham, N.Y.; 51; assistant professor of neurology at the Cornell University Medical College, New York; 24 Nov.

WILLIAM L. BRYAN, Bloomington, Ind.; 95; psychologist; president emeritus of Indiana University; 21 Nov.

CLEMENTS C. FRY, New Haven, Conn.; 63; psychiatrist in charge of the department of university health, Yale University, and lecturer in psychiatry and mental health; 24 Nov.

MAUDE GLASGOW, New York; 87; retired physician who lectured at Teachers College, Columbia University, New York; 20 Nov.

RICHARD L. HARRIS, Montrose, N.Y.; 59; assistant professor of clinical psychiatry at the Cornell University Medical School, New York; 23 Nov.

THOMAS C. MCBRIDE, Bryn Mawr, Pa.; 87; retired mechanical engineer; 24 Nov.

RUSH F. NEWCOMB, New Providence, N.J.; 77; retired electrical engineer, former treasurer of Bell Telephone Laboratories, Murray Hill, N. J.; 26 Nov.

MALCOLM PROUDFOOT, Oxford, England; 48; associate professor of geography at Northwestern University, Evanston, Ill.; 21 Nov.

LASZLO REINER, Verona, N.J.; 61; research associate at the Institute of Cancer Research, Columbia University, New York; 27 Nov.

HAROLD R. SANSTEAD, Silver Spring, Md.; 54; staff member of the Laboratory of Biochemistry and Nutrition at the National Institute of Arthritis and Metabolic Diseases; acting executive director of the Interdepartmental Committee on Nutrition for National Defense; 1 Nov.

WILLIAM B. SWARTLEY, Philadelphia, Pa.; 71; instructor in anatomy at Jefferson Medical College for 28 years; former director of surgery at Germantown Hospital and chief of surgery at Chestnut Hill Hospital and Philadelphia Hospital for Contagious Diseases; 15 Nov.

JEAN P. WASSERMAN, Basel, Switzerland; 82; expert on alloys; 20 Nov.

Education

■ High-school students will have an opportunity to learn about careers in physics through a series of lecture-demonstrations in Chicago that are patterned on the Christmas Juvenile Lectures that have been given every year since 1826, except for a short period during World War II, at The Royal Institution of Great Britain in London. The lectures, which were instituted by Michael Faraday, are delivered during the holiday season. The new series in Chicago has been planned by the Chicago High School Physics Teachers Association in cooperation with the Physics Club of Chicago and four Chicago-area colleges and universities: Illinois Institute of Technology, the University of Chicago, Northwestern University, and the University of Illinois at Navy Pier.

The first lecture is titled "Fire magic" and will be presented by Llewellyn Heard, a chemist for the Standard Oil Company of Indiana. It will be delivered on 21 Dec. at Illinois Institute of Technology. Instead of 1 week of daily lectures as during Faraday's time, physics educators hope to establish two or three regular programs each semester.

■ The George B. Pegram Laboratory, containing a 6-Mev generator for nuclear research, was dedicated last month at Columbia University. Construction of the laboratory began the first of this year. It has been completed at a cost of about \$400,000. The Van de Graff generator, which cost \$450,000 installed, was lent by the Atomic Energy Commission. The commission also contributed \$295,000 to the construction cost of the building.

The laboratory is named for Pegram, an atomic physicist who is now vice president emeritus of Columbia and a special adviser to the president of the university. He was chairman of the Columbia University Committee on War Research from 1941 to 1945, and was a key figure in the establishment of the Atomic Energy Commission's Manhattan District.

■ A 4-week pilot course for training military veterinary laboratory officers in methods of detecting radioactivity in food and in food radioassay procedures will begin on 9 Jan. 1956 at the Walter Reed Army Institute of Research. The course will be open only to laboratory officers who have completed the veterinary radiological health course at the Institute of Nuclear Studies, Oak Ridge, Tenn.

The basic training for the new course will be given by the Walter Reed biophysics department; the Veterinary Di-

vision will be responsible for the applied techniques. Additional courses in food radioassay instruction will be given from time to time, but no date has been set for a second class.

■ Through a modernization of curriculums and facilities, the University of Pennsylvania has announced that it is able to accommodate 50 percent more engineering students than are now enrolled. The decision to increase enrollments comes during the celebration of the centennial year of the engineering program. About 1200 students are enrolled in the university's schools of chemical, civil, mechanical, and metallurgical engineering and its Moore School of Electrical Engineering.

Carl C. Chambers, vice president for engineering affairs, said that a combination of circumstances had given the university's five engineering schools the capacity to educate more students without impairing academic standards. He cited these factors:

In the modernization of curriculums, more emphasis has been placed on analytic studies and the humanities and less on shopwork and drafting; this makes certain facilities available to more users.

Completion last year of the university's new physical sciences building has enabled the physics and mathematics departments to teach those required subjects to more engineering students.

Fuller use is being made of other buildings and facilities beyond the normal classroom day, especially through an expanded evening program for graduate students.

Growth of the university's engineering research has drawn to the campus many highly qualified scientists who are available for teaching as well as for research.

Grants, Fellowships, and Awards

■ To help offset the dangerous cutback in science teaching at the secondary level, Shell Companies Foundation, Inc. has announced a program of recognition fellowships for high-school teachers of science and mathematics. Through the program, worked out with the cooperation of leading educational associations, Shell will underwrite summer seminars at Stanford and Cornell universities for 60 teachers yearly. The fellowship recipients, chosen on the basis of merit and demonstrated leadership qualities, will receive travel allowances, all tuition and fees, living expenses on the university campus, and \$500 in cash to make up for the loss of potential summer earnings.

Basically, the program, to be known as the Shell Merit Fellowships for High School Science and Mathematics Teach-

ers, seeks to inspire those science teachers who in turn can best inspire the scientists and science teachers of tomorrow.

Last year, according to surveys, American colleges turned out 57 percent fewer mathematics teachers than in 1950. Because of the acute science teacher shortage, more than half the high schools in the country now have no classes in physics or chemistry.

Since 1900, the percentage of students studying algebra in the high schools has fallen from 56 to 24 percent; the percentage of geometry students has dropped from 27 to 11 percent. Today, only 4.3 percent study physics—as against 19 percent some 55 years ago.

Stanford and Cornell were selected by Shell because of their outstanding science and education departments and their active role in trying to remedy the science teacher shortage. The fellowships are particularly designed for the able, experienced teachers who ordinarily might seek remunerative summer employment outside the school system. The intensive seminar programs will include graduate-level classes, lectures by outstanding scientists, and visits to modern industrial installations and research laboratories.

Mathematics, physics, or chemistry teachers with 5 years of experience and known leadership ability will be eligible for the fellowships. Thirty teachers from west of the Mississippi River will attend the 8-week Stanford program, which will be administered by the School of Education. Thirty teachers from east of the Mississippi will be invited to a similar 6-week series of courses at Cornell.

In addition to teachers, also eligible are present heads of departments or supervisors with good background in mathematics, chemistry, or physics who previously were teachers. Final selection of the candidates will be the full responsibility of Stanford and Cornell.

■ Fellowships in systems engineering for the academic year 1956–57 have been announced by the Ramo-Wooldridge Corporation in cooperation with California Institute of Technology and Massachusetts Institute of Technology. The program for each fellow covers a 12-month period and will provide the recipient with an opportunity to pursue a broad course of fundamental study as well as an opportunity to work with practicing engineers and physicists in the field of systems engineering.

The emphasis on systems engineering, which may also include the techniques and practice of operations research, is a reflection of the growing need in industry for individuals trained to solve advanced design problems involving the complex relationship between electrical, mechanical, aeronautical, and chemical portions of complete systems.

The award winners will be expected to begin the year's program in July 1956 with 8 to 10 weeks of advanced development work at Ramo-Wooldridge. The remainder of the time will be spent at C.I.T. or M.I.T. on work toward the doctor's degree or in postdoctoral study.

Each fellow will receive a cash award of \$2000 or more, depending on his family responsibilities, in addition to a salary of about \$2000 for summer and part-time work at Ramo-Wooldridge. A grant of \$2100 for each fellowship will go to the institute involved to cover tuition and research expenses.

A candidate must be an American citizen whose qualifications and background will admit him to the graduate school of either C.I.T. or M.I.T. and who has completed 1 year of graduate study in mathematics, engineering, or science, before the beginning date of the fellowship.

Application may be obtained by writing to the Ramo-Wooldridge Fellowship Committee, Ramo-Wooldridge Corporation, 8820 Bellanca Ave., Los Angeles 45, Calif. Completed applications, together with reference forms and a transcript of courses and grades, must be received *not later than 20 Jan. 1956*.

■ Muscular Dystrophy Associations of America, Inc., New York, recently allocated \$175,642 for six new projects to study muscular dystrophy and for continuation of 13 other research projects. This brings the number of current research projects to a total of more than 70. Some 200,000 Americans suffer from this disease, most of them children.

■ The Stewart-Warner Corporation, Chicago, Ill., has established four 4-year engineering scholarships, three in mechanical engineering and one in electrical engineering, to be awarded to deserving high school graduates of exceptional ability through the National Merit Scholarship Corporation scholarship award program [*Science* 122, 508 (16 Sept. 1955)]. Stewart-Warner is the third organization to announce participation in the new program by establishing specific scholarships.

Previous scholarship contributors have been the Sears-Roebuck Foundation and Time, Inc. Stewart-Warner's action will release matching funds from the working funds of National Merit Scholarship Corporation for four additional scholarships.

■ The National Academy of Sciences—National Research Council has announced the continued availability of grants-in-aid for research on sex problems. The NAS-NRC Division of Medical Sciences is responsible for the administration of the grants, which are

awarded on recommendation of its Committee for Research in Problems of Sex. Funds for the support of this program are provided by the Rockefeller Foundation. The committee welcomes the co-operation of universities and research institutions in making these opportunities known to members of their staffs.

Applications for grants for the fiscal year 1956–57 must be postmarked *on or before 1 Feb. 1956*. Preliminary correspondence regarding research projects should be addressed to the Committee for Research in Problems of Sex, Division of Medical Sciences, National Academy of Sciences—National Research Council, 2101 Constitution Ave., N.W., Washington 25, D.C.

■ The Carnegie Institute of Technology has announced the availability of teaching assistantships, graduate fellowships, and research assistantships for 1956–57 in the College of Engineering and Science. It is suggested that candidates write for application forms and information at an early date.

Applications, together with transcripts of record and other supporting evidence, should be submitted soon, preferably *not later than 1 Feb. 1956*. However, applications from well-qualified candidates will be considered even if they are received at a later date. Address all inquiries to Dean of Graduate Studies, Carnegie Institute of Technology, Pittsburgh 13, Pa.

■ Establishment by Chas. Pfizer and Company, Inc., Brooklyn, N.Y., of a \$4500 postdoctoral fellowship in microbiology at the Institute of Microbiology at Rutgers University has been announced jointly by Pfizer and Rutgers. The new grant will be known as the Pfizer Post-Doctoral Fellowship in Microbiology. It will become effective on 1 Jan. 1956. The recipient is to be selected by the fellowship committee of the Rutgers Graduate School recommendation of Selman Waksman, director of the Institute of Microbiology.

In the Laboratories

■ Fairchild Camera and Instrument Corporation, Syosset, N.Y., has established a nuclear instrumentation department headed by Harold Eugene DeBolt, nucleonics expert. DeBolt was formerly associated with the nuclear power division of the Navy's Bureau of Ships and the Naval Reactor Branch of the Reactor Development Division of the Atomic Energy Commission.

Products under consideration for development and manufacture include radiation monitoring equipment, control-rod drive mechanisms for reactors, neutron

detectors, and temperature, pressure, and flow controls. Packaged reactor controls and instrumentation systems will be designed mainly for commercial nuclear power developers and to some degree for the military.

Immediate expansion of the new group will be in the engineering field, with personnel being drawn both from within the company and externally. It is expected that actual product deliveries will begin in 1956.

■ The California Spray-Chemical Corporation formally opened its new biological research laboratory in Richmond, Calif., in September, marking the first stage of a major expansion of its research and development department. Future plans include a \$16-million fertilizer plant and additions to chemical laboratories.

The new laboratory, which will be headed by W. D. Thomas, Jr., former plant pathologist for the Colorado Agricultural Experiment Station, was remodeled from a building formerly used by the California Research Corporation. It contains rooms with filtered air sources for maintaining experimental insect and animal colonies, and new equipment for expanding investigations on fungicides, insecticides, bactericides, herbicides, and nematocides.

■ Varian Associates, Palo Alto, Calif., has entered the field of high-energy radiation. The company is planning construction of its own linear electron accelerator, under license recently obtained from Stanford University, and has undertaken development of special accelerator parts for the University of Chicago.

■ Nearly 100 technologists attended the first Norelco electron microscope school, 14-18 Nov., in the application laboratory of the Research and Control Instruments Division, North American Philips Company, Inc., 750 South Fulton Ave., Mount Vernon, N.Y. Participants brought many of their own specimens and micrographs to the meetings for discussion and interpretation.

The school will be held again in 1956. Exact dates will be announced later, and technologists who are interested in attending should write to C. J. Woods at the Mount Vernon address as soon as possible.

■ Looking toward the potential world market for commercial nuclear reactors, North American Aviation, Inc., Los Angeles, Calif., has established the Atomic International Division as a separate division to handle all of the company's nuclear engineering and manufacturing operations. The division is headed by Chauncey Starr, vice president and gen-

eral manager, who has directed the company's atomic energy research and development program for nearly 10 years.

Miscellaneous

■ A new monthly journal, *Nuclear Physics*, is to be published by the North-Holland Publishing Company, Amsterdam, and distributed in the United States by Interscience Publishers, Inc., New York. An annual volume of approximately 700 pages is planned, but more volumes may be scheduled if required. The subscription price is \$15 per volume.

The new journal will be devoted to the experimental and theoretical study of atomic nuclei, not excluding those lines of research that may be expected to throw light on the nature of the nuclear forces—that is, on the one hand, the quantum theory of fields, and on the other hand, the investigation of elementary particles. However, there is no rigid delimitation of the scope of the journal.

The emphasis will be laid on the publication of original papers, including extended reports of completed research as well as shorter notes announcing new results or presenting remarks and suggestions. An effort will be made to provide longer review articles or shorter reports dealing with questions of topical interest. Moreover, as occasion arises, the journal will publish book reviews and news items of interest to nuclear physicists.

The international character of the journal is insured by the composition of the editorial board, which includes representatives from all countries or groups of countries in which nuclear studies are being pursued.

Contributions may be sent to the editor, Prof. L. Rosenfeld, Dept. of Theoretical Physics, The University, Manchester, England, either directly, or preferably through the intermediary of one of the members of the editorial board of the country or region in which the author is working. A list of these board members may be obtained from Interscience Publishers, Inc., 250 Fifth Avenue, New York.

■ In January the American Psychological Association will initiate publication of a new monthly journal entitled *Contemporary Psychology: A Journal of Reviews*. Edwin G. Boring of Harvard University has been named editor of the new journal. Adolph Manoel of Park College will serve as film editor. A group of 26 consultants in the specialized fields of psychology will assist Boring.

It is the aim of *Contemporary Psychology* to provide critical reviews of books in the broad field of psychology

and related sciences, thus providing more comprehensive coverage of the psychological literature. Book reviews that formerly appeared in the APA journals *Psychological Bulletin*, *Journal of Applied Psychology*, *Journal of Abnormal and Social Psychology*, and *Journal of Consulting Psychology* will be concentrated in the new journal.

Subscriptions to *Contemporary Psychology* will be \$8 a year, foreign subscriptions \$9.50 a year, with single issues priced at \$1 each. Correspondence regarding subscriptions should be addressed to American Psychological Association, 1333 16 St., NW, Washington 6, D.C. Correspondence with the editor should be sent to Dr. E. G. Boring, Memorial Hall, Harvard University, Cambridge 38, Mass.

■ A group of friends of T. Duckett Jones have initiated the T. Duckett Jones Memorial Fund in the belief that the finest acknowledgment of Jones' work in medical research would be the establishment of a fund devoted to advancing the research objectives to which he gave so much of himself. At present the fund committee is of the opinion that research in rheumatic fever, which was the subject of much of Dr. Jones' own research activity, might be given priority by the fund's administrators, but not an exclusive claim on its income.

Depending on the amount received, there are a number of awards that might be made to represent the philosophy and professional interests of Dr. Jones. Among the several already suggested are fellowships for promising young investigators, short-term support for investigators holding permanent positions to permit completion of studies or projects, or endowment for a T. Duckett Jones professorship in a university.

Further suggestions are welcomed by the committee. Contributions are tax exempt and should be sent to the T. Duckett Jones Memorial Fund, 525 E. 68 St., New York 21.

■ The Society of Sigma Xi has awarded funds to Irving W. Knobloch in order that he may continue to compile a list of hybrids reported for the plant and animal kingdoms. Knobloch would appreciate receiving both published and unpublished lists of hybrids in any group of plants or animals. Address: Dept. of Natural Science, Michigan State University, East Lansing.

■ The problems of the arid lands and the methods used by modern science in an international effort to solve them, are described in the November issue of the *UNESCO Courier*, the monthly magazine of the United Nations Educational, Scientific and Cultural Organization.

Reports and Letters

Attempted Dendrochronological Dating of Ice Island T-3

Ice islands floating in the Arctic Ocean have been studied for some years, particularly by scientists attached to the U.S. Air Force. Unlike the thin pack ice of marine origin that largely covers the northernmost seas, and with which they float freely around the New World side of the polar basin, these ice islands have upper layers that are composed of fresh-water ice. This is mainly iced firn (névé) formed *in situ* from snow, although glacier ice is sometimes included. The lower layers are contrastingly salt or brackish, being presumably accreted from below (1).

These islands are supposed to have originated as shelf ice on the northernmost coasts of the world, on Ellesmere Island or in some cases possibly Greenland; they evidently broke loose from such places to become free floating (2). The known arctic ice islands are up to nearly 20 miles in length, the largest, T-1, having an area of some 300 square miles; the smaller T-3, which has been lived on protractedly and investigated intensively, has proved to be approximately 31 miles in circumference and 165 feet in thickness (3).

Drifting as they do far north of any land, and indeed often into the very highest latitudes, these ice islands can be of importance as meteorological and general scientific stations and perhaps for other purposes. They can even afford extensive "landing grounds" for aircraft near the North Pole. In connection with these purposes, it is desirable to know the durability and degree of permanence of the ice islands. One of them appears to have broken away from the shelf ice during the past decade (2), but others may possibly have existed for centuries and certainly they may change scarcely at all in shape or thickness from year to year. Some of the component material of T-3 has been indicated by carbon-14 testing to be thousands of years old, whereas other material so tested appears to be relatively modern and may be quite recent (1, 4). The older datings may be in part the result of the blowing in of fossil carbon, but on the other hand

much of the material appears to be too modern for proper dating by these means. In any case, the age of the component materials bears little or no relationship to the age of the ice island *as such*—that is, the time since it broke away from the shore or land-fast shelf ice and became a free-floating entity—nor, in view of the circumstances involved and the lack of differential, would this "operative" age seem determinable by any such physical means.

The main hope of dating T-3 as the studied example of these potentially important ice islands seems to lie in the plant materials that have been found upon or within its layers of névé (5). These materials include numerous pieces of wood of the arctic willow (*Salix arctica* s.l.) that grows more or less flat-pressed against the ground on the northernmost coasts of Ellesmere Island and Greenland. Such scraps of willow often exhibit clear but very variable growth rings and appear to have been washed down from the land when the ice island was attached to it as part of the shelf ice. A few of the pieces on T-3 exceeded 2 centimeters in diameter. They were always dead when collected and evidently had grown on land; clearly the ice on which they were found could therefore be assumed to have been attached to the land as long as any of these growth rings were being laid down. Similarly, the breakaway of the ice island had evidently taken place after the laying down of the last growth ring to be found in these specimens, for other possible sources of the willow material, such as washing on from the sea, had meanwhile been virtually ruled out (5).

Toward an attempt to determine the date of the most recent growth ring laid down among the material recovered from T-3, and consequently the earliest possible date of breakaway of the ice island as such, three basic studies were undertaken (6).

First, through material collected in northernmost Ellesmere Island in 1953 by G. Hattersley-Smith of the Defence Research Board of Canada, a study was made of the effect of different habitat conditions on the growth rings of willows living in the very Far North. The

results proved to be so variable and any correlation so fickle that it became evident that the work would be intricate and that any result would probably be tentative. Thus there appeared to be extreme variation, not only with the immediate water conditions and exposure, but also with snowlie, permafrost melting, and probably also with air temperatures and various microhabitat factors that further complicated the situation by being almost all interdependent!

Second, in an attempt to obtain a satisfactory "base-line" for counting back, a large sample of willows was collected in 1954 by A. P. Cray of the Air Force Cambridge Research Center along a single fairly even slope on the southwestern side of Ward Hunt Island, in the region of northernmost Ellesmere from which T-3 may well have come. Even here, the growth, as indicated by growth-ring widths, tended to be too variable to afford a satisfactory statistical basis for counting back. Laborious weeks of comparison and measuring were occupied chiefly by projecting images of the stained sections of the willow stems onto a screen by means of a bioscope and measuring each ring on several widely spaced radii, these readings being averaged to give a figure for each ring. Yet when all the results from 10 specimens more than 25 years old were averaged, the deviation except in the initial years was too small for satisfactory use. One reason seems to have been the multiplicity of the aforementioned operative factors and another that some individuals evidently made little or no growth in particular years. This and the frequent discontinuity of some rings immediately threw attempted correlations off in a manner that may also occur in forested regions (7) and seemed to be an insurmountable obstacle to satisfactory counting in some of the material grown under the extremely rigorous conditions of the farthest northlands. Quite often a ring appeared to be represented by a partial "lens," and sometimes one would be broken by radial gaps that in some cases occupied practically the entire circumference. Occasionally only a very few adjacent cells of cambium appeared to have exhibited any activity—sometimes merely to the extent of producing one small vessel each—in any particular period; but whether this period represented a whole summer's growth, or less, could not be determined. Specialists' opinions differed, but with the extremely short maximum growing season thereabouts it is difficult to visualize more than a single ring or distinct partial ring being laid down in any one summer.

Third, museums and herbariums were searched for specimens of willow wood collected by the earliest expeditions to these highest latitudes of land. The only

long-lived one that came to light was a gnarled and partly decayed piece of stem in the Museum of the Royal Botanic Gardens, Kew, from which I was kindly permitted by the keeper, F. N. Howes, to cut a scrap for sectioning. This was "from Highest Greenland" and appeared to exhibit some 130 growth rings. Having been collected by the British "Alert and Discovery" expedition of 1875-76, it thus dated back to well before the beginning of the 19th century. However, the rings were scarcely such as might be used for correlation with other specimens, for they were often small and irregular or even uncertain. Similarly unsatisfactory were the only two Ward Hunt Island specimens that showed any comparably large number of rings.

Whereas it seems clear from these considerations that, at least without much more basic knowledge than has yet been gained, the satisfactory dating of T-3 by dendrochronological means is scarcely to be accomplished, the following circum-

stances would appear to warrant some degree of confidence in a tentative dating that has been obtained.

It has long been recognized that for dating purposes with trees it is not so much the normal fluctuations in growth-ring width as the low extremes that are valuable. However, with the generally adverse conditions in the very Far North, low extremes may be represented by one or more summers of little or no growth; here it is rather the favorable summers that are unusual, and therefore a thick ring or series of rings is likely to be especially significant. Using these thick and usually complete rings as "markers," and ignoring occasional very thin and sectorially narrow lenses that might, or might not, represent a summer's growth, it was observed that some of the willows from Ward Hunt Island exhibited, for ecological or genetical reasons, what appeared to be similar reactions to climatic changes. Thus the thick markers were at least bordered by rings of comparable

width in the different specimens or by rings showing a comparable amplitude of increase or decrease. This "principle of reaction similarity," as it was loosely termed, seemed to allow comparison between sections, particularly on the basis of the width of growth rings as found on the longest radius of a transverse section.

Ignoring first of all specimens that did not show more than 35 clear growth rings and, second, all that showed any substantial proportion of unclear rings, we were left with six stem specimens from Ward Hunt Island and five from T-3. Of the former, one alone exhibited more than 50 clear rings. This one showed good correlation with one of the T-3 stems, as is indicated in Fig. 1. Thus, except in the initial years of growth—which experience has shown should be ignored—the maxima either coincided or were paired with wide rings; the minima observed also tended to coincide. In making comparisons we should remember that it is these extremes that are most significant and that the Ward Hunt Island specimen in general exhibited better growth—possibly because of its southwest-facing habitat—than the T-3 specimen. The measurements involved were kindly checked by A. P. Stiermott, while Haig P. Papazian reported that the coefficient of correlation r for these two sets of figures is

$$r = 0.75$$

which for 36 degrees of freedom is significant at less than the 0.001 level, and therefore would be expected to occur by chance far less frequently than once in 1000 times. This is a much higher degree of significance than is usually accepted for biological data, although it should be recalled that it does not take into account the fact that choice was exercised on the five T-3 specimens. However, the other four specimens may well have grown in earlier times (1, 4) and for that reason alone have had virtually no chance of correlation.

As is indicated in Fig. 1, these observations strongly suggest that this piece of willow was still growing on land during the summer of 1935, and, accordingly, that the ice island broke away subsequently. Because it was observed free from land early in 1947, it would seem that T-3 became an island at some time between these two dates.

This attempted dating must be emphasized as being only tentative and, moreover, based on a shorter span of time than is usually required (8). However, it is interesting to note that the middle 1930's are said to have been the period of maximum marine warming in these regions and that the only living macroscopic plant found on T-3 was a wide tussock of the moss *Hygrohypnum*

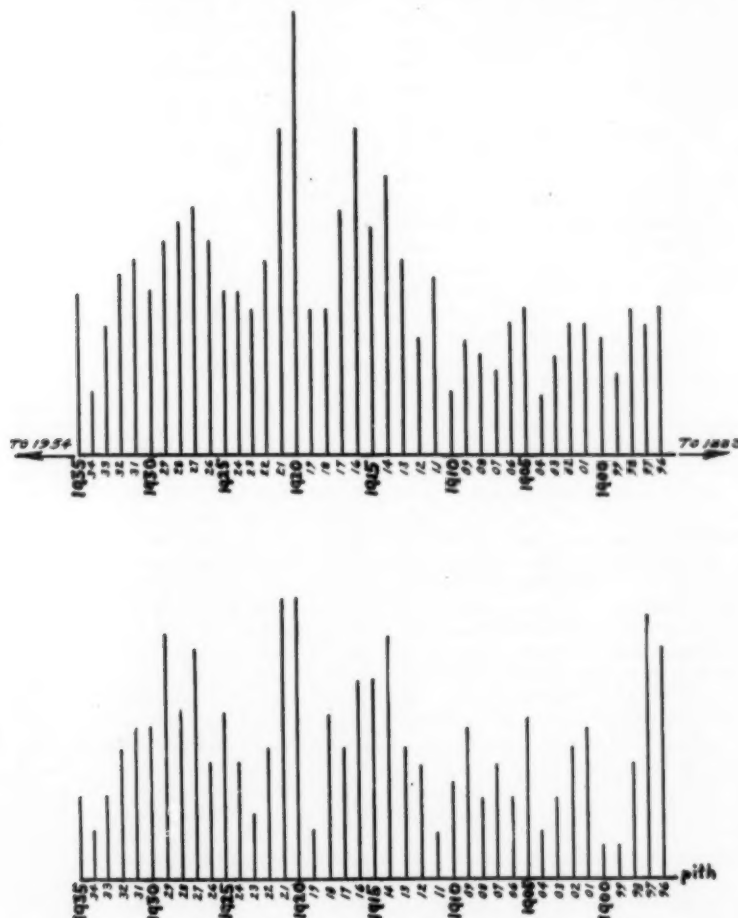


Fig. 1. Top, Ward Hunt Island willow stem; bottom, T-3 willow stem. The vertical lines represent growth-ring widths, obtained as explained in the text.

polare, which is presumed to have grown on the land (9). If it had been washed or blown onto T-3 in 1935, it would have lived 19 years to the time when a piece of it was revived in the laboratory (early in 1954; the next year the remainder could not be revived). This is precisely the longest period of which a record could be found of a moss tussock remaining viable in a herbarium (10).

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26 September 1955

Electrophoretic Separation of Hemoglobins from the Chicken

Investigations of the dissociation of oxyhemoglobin in birds (1, 2) have led to the suggestion that there are two hemoglobins, one embryonic and one adult. Such differences exist in various mammalian species; these have been summarized by Lecks and Wolman (3). Recently, electrophoretic methods have been successfully used in separating mammalian hemoglobins (4). It appeared that the nature of avian hemoglobins could profitably be examined by a similar technique (5).

Hemoglobin was obtained from embryos and adults of White-Olympian-New Hampshire cross chickens. Blood samples were drawn from the vitelline artery, the heart, or from the radial veins, depending on the age of the chicken.

Embryonic bloods from several individuals in a single age group were pooled to form a single sample for analysis. Heparin was employed as the anticoagulant. The cells were separated from the plasma by centrifugation and washed three times with 0.85-percent sodium chloride. The hemoglobin solution for analysis was prepared by adding 2 vol of distilled water to 1 vol of packed erythrocytes. The supernatant fluid, after centrifuging, was stored at -10°C , then thawed at room temperature for use. Electrophoretic patterns were obtained by applying 5 μl of this hemoglobin solution to the filter paper strips (S. and S. No. 204-313, 20 mm wide) in a thin line. A controlled voltage (300 v) was applied to the strips for 6 hours; the current increased from 6 to 12 ma. The strips were moistened with Veronal buffer (pH 8.8, ionic strength 0.05) prior to application of the sample. Boundary diagrams were prepared by direct readings of paper strips in a spectrophotometer (6). The results are plotted in Fig. 1.

The samples tested were from embryos (13, 15, 18, and 20 days), hatched chicks (up to 6 hours and 1, 2, 4, 6, 8, 11, and 18 days), and 6-month-old and 2-year-old chickens.

Two hemoglobins were observed in each age group tested. No marked differences were apparent among specimens. The faster moving component, designated as α -hemoglobin, appeared to be in lower concentration. The slower moving component was β -hemoglobin. Migration was toward the anode; the rate of migration was uniform in all samples (Fig. 1). Percentage composition of the hemoglobins, as determined by planimetry of boundary diagrams, appeared to vary with age. There was an approximate 30-percent reduction of the α component in the 2-year-old chicken as compared with the 18-day embryo—that is, 30 percent α and 70 percent β in the embryo, and 20 percent α and 80 percent β in the adult. Determinations on a limited number of samples indicated that the major portion of the change occurred within a few days after hatching.

As early as the 13th day of incubation, two hemoglobins are present. If one were essentially an embryonic hemoglobin and the other an adult hemoglobin (1), the replacement of the former by the latter

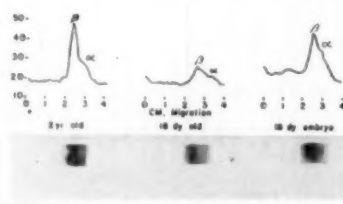


Fig. 1. Electrophoretic analysis of chicken hemoglobin.

would be expected. It appears that no such major replacement occurs. The average life-span of an avian erythrocyte has been reported to be approximately 32 days (7); yet the hemoglobin of both 6-month and 2-year chickens exhibits α and β components in relatively the same proportions as is found in young (18-day) chickens. A logical explanation of hemoglobin types is readily available in mammals; however, in birds, where no placental transfer of oxygen occurs, this explanation does not directly apply.

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20 July 1955

Production of Fungistatic Substances by Plant Tissue after Inoculation

Among the various attempts to learn how plants are able to resist invasion by pathogens, the most successful is the work of Link et al. (1-3), Angell, Walker, and Link (4), and Walker and Link (5), who showed that protocatechuic acid and catechol in the outer scales of colored onions were responsible for resistance to smudge and neck rot. Other instances of specific resistance owing to the presence of biochemical entities have been suggested but not proved. Johnson and Schaal (6) suggest that chlorogenic acid in the potato peel participates in resistance to scab. Müller and Behr (7) point out that tanninlike substances in the potato may be associated with resistance to late blight. The possibility that a pathogen-inhibiting substance might be produced by plant tissue in response to the presence of a pathogen has been conceived by some workers in the field. However, experimental proof has been lacking heretofore.

Helminthosporium carbonum race I, the incitant of a leaf-spot disease of corn, has an exceedingly narrow host range (8).

Within the species *Zea mays* L., only a few inbred lines, homozygous for the gene pair *hm/hm*, are known susceptibles (9). The resistance of most inbred lines of corn to invasion by this fungus may be basically similar to that expressed by the tissues of nonhosts. This paper reports the results of some of the experiments set up to examine this hypothesis (10).

The potato tuber was found to be a useful nonhost for this study. Substances inhibitory to the growth of *Helminthosporium carbonum*, *Ceratostomella ulmi*, and *Fusarium oxysporum* f. *lycopersici* were found in potato peel. The inhibitory substances were not present in potato pulp tissue but were produced in the pulp tissue following inoculation with these fungi. None of the fungi employed for inoculations are known to incite disease in potatoes.

For the experiments, Idaho-grown potatoes (var. Netted Gem) free from visible surface defects were washed with soap and water and surface-sterilized by immersion for 2 minutes in an aqueous 2.5-percent solution of sodium hypochlorite. After the potatoes had been washed with sterile water and dried, peel tissue approximately 1 mm thick was removed. Fresh pulp tissue was obtained from potatoes after removal of the peel. Inoculated pulp tissue was obtained by covering sterile fresh potato slices, approximately 1 cm thick, with a heavy spore suspension of *H. carbonum*, *C. ulmi* or *F. oxysporum* f. *lycopersici*. Slices were incubated in sterile petri dishes at 22°C for 72 hours in a moist atmosphere. Sections of heavily inoculated slice surface 1 mm thick were removed for extraction. Autoclaved potato slices were also inoculated with each of the fungi and then were incubated under the same conditions. Control pulp tissue was provided by holding sterile potato slices at 22°C for 72 hours.

Extracts were prepared by placing 40 g of tissue in 300 ml of boiling alcohol and boiling for 2 to 5 minutes. After cooling, the tissue was macerated for 5 minutes in a Waring Blendor, and the homogenate was filtered through Whatman No. 2 filter paper on a Büchner funnel. The filtrate was concentrated to dryness under reduced pressure at 40°C; then the residue was redissolved in 50 ml of water and filtered through glass wool. Two grams of dehydrated potato dextrose agar (11) was dissolved in the filtrate, and the solution was autoclaved at 15-lb pressure for 10 minutes. Petri dishes containing 16 ml of the sterile nutrient medium were seeded with dilute spore suspensions of *H. carbonum*, *C. ulmi*, or *F. oxysporum* f. *lycopersici* and were allowed to incubate at 24°C.

Helminthosporium carbonum made good growth in 5 days, both on the dehydrated potato dextrose agar medium

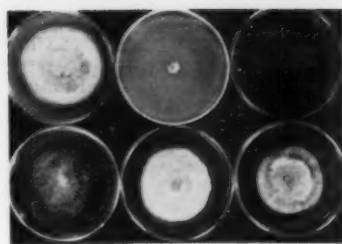


Fig. 1. Growth of *H. carbonum* on potato dextrose agar to which was added extracts of the following potato tissues. (Top, left to right) Fresh pulp; pulp tissue inoculated with *H. carbonum* and incubated for 72 hours at 22°C; peel. (Bottom, left to right) No extract added to the potato dextrose agar; pulp tissue autoclaved, then inoculated with *H. carbonum* and incubated 72 hours at 22°C; control pulp tissue, not inoculated but held 72 hours at 22°C.

and on the agar medium to which was added the extract of fresh potato pulp or the extract of autoclaved inoculated potato pulp. Moderate to good growth occurred on the medium to which was added an extract of control pulp. The fungus made little or no growth on the medium containing either the extract of peel or the extract of inoculated pulp tissue. *Ceratostomella ulmi* and *F. oxysporum* f. *lycopersici* responded similarly. The results are illustrated in Fig. 1. The fungi showed excellent growth on the autoclaved potato slices but very little growth on the fresh potato slices at the end of the incubation period (72 hours). Potato slices held overnight at -20°C and then inoculated supported excellent growth of these fungi within 72 hours of incubation. Extracts from such frozen, inoculated potato slices, when added to potato dextrose agar, had no inhibitory effect and were in this respect similar to extracts prepared from autoclaved inoculated pulp.

These results suggest that living potato tuber tissue, when inoculated with *H. carbonum*, *C. ulmi*, or *F. oxysporum* f. *lycopersici*, produces a substance or substances inhibitory to the growth of these fungi. Potato peel appears to contain a high concentration of inhibitory material, but here inoculation is unnecessary for its elaboration. The inhibitory material seems to be localized at the site of inoculation, since extracts of tissue taken 5 mm from the inoculated surface showed no inhibitory effects on the growth of the fungi. Carrot and turnip tissue responded in a manner similar to that described for potato tuber tissue.

Potatoes, carrots, and turnips appear to have a twofold mechanism for immunity from attack by the fungi studied. Inhibitory substances are present in peel tissue, the first barrier to penetration;

however, if the peel tissue is injured or removed, adjacent pulp tissue is capable of producing inhibitory substances immediately around the points of penetration. These inhibitors do not appear to be translocated.

Both the passive resistance of the peel and the active resistance produced by the pulp appear to be nonspecific. The same inhibitors appear to be produced as a response to penetration by the three fungi studied, since the substance produced in response to one fungus was found to inhibit the other fungi.

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19 July 1955

Enteric Cytopathogenic Human Orphan (ECHO) Viruses

The recovery in different laboratories of large numbers of new cytopathogenic viruses from the human intestinal tract led to the cooperative effort described in this report. The work was undertaken as a start in determining the significance of these agents. The viruses were obtained from patients with the aseptic meningitis syndrome (often diagnosed as nonparalytic poliomyelitis) as well as from healthy children in different parts of the world.

Preliminary studies of these viruses indicated that multiple antigenic types exist (1-4). Individual prototype strains and serums were exchanged among members of the Committee on the ECHO Viruses for performance of cross-neutralization tests. A uniform technique was adopted for these tests, employing for the inoculum of each tissue culture a

mixture containing 100 TCD₅₀ of viruses and an equal amount of antiserum containing 20 units of antibody against its homologous virus. Twenty units represented a 20-fold concentration of that dilution giving 50-percent neutralization of 100 TCD₅₀ of virus.

This cooperative study has resulted in the differentiation of the 13 antigenically distinct viruses that are listed in Table 1. These viruses—some of which have been referred to in previous literature as “orphan viruses” (1) and others as “human enteric viruses” (2)—are now classified as the “enteric cytopathogenic human orphan (ECHO) group” (5). They share the following properties. (i) They are cytopathogenic for monkey and human cells in culture (1-4). All 13 prototype strains were isolated in cultures of monkey kidney cells, which for the strains tested proved to be more susceptible than HeLa cells. (ii) They are not neutralized by pools of the three types of poliomyelitis antiserum. (iii) They are not neutralized by antisera for Coxsackie viruses that are known to be cytopathogenic in tissue culture, and they fail to induce disease in infant mice. (Animals less than 24 hours old should be used, for they have greater susceptibility.) (iv) They are not related to other groups of viruses recoverable from the alimentary tract (throat or intestine) by inoculation of primate tissue culture, such as herpes simplex, influenza, mumps, measles, varicella, and the ARD (acute respiratory disease) or APC (adenoidal-pharyngeal-conjunctival) group. (v) They are neutralized by human gamma globulin and by individual human serums; this indicates that they infect human beings.

Other studies of the ECHO viruses (more extensive for some than for others) have provided additional information. Complement-fixing antigens have been detected in the culture fluids of a num-

ber of viruses that have been tested (1, 3). All the viruses tested were ether-resistant. Ultrafiltration (gradocol membrane) measurements indicated sizes for types 1, 2, and 3 between 11 and 17 mμ (1). The size of type 10 is reported to be between 60 and 90 mμ (2). Plaque morphology of the ECHO viruses studied (types 1, 3, 4, 5, 6, 7, and 9) is sufficiently distinctive, except for type 7 (Garnett strain), to permit differentiation from polio virus plaques (6). The plaques of the ECHO viruses mentioned had irregular diffuse boundaries, and healthy cells could be found within the degenerated areas.

Kidney cells of different monkey species vary in their susceptibility to the ECHO viruses. Rhesus (*Macaca mulatta*) and cynomolgus (*M. irus*) cells are susceptible to all 13 types studied. Cells from the South American capuchin (*Cebus capucina*) were found to be resistant to types 1, 2, 3, 7, 8, 9, and 11 (2, 6). However, they were susceptible to type 10 (2). Cells from the African red grass military monkey (*Erythrocebus patas*), which were resistant to types 1, 2, 3, 4, 5, 6, and 9, were as susceptible as those from the rhesus monkey to the type 7 Garnett strain (6).

It is emphasized that this committee is not an authoritative body but rather a group of investigators who, together with others present at the Conference on Orphan Viruses, felt the need for a working approach to a classification of this heterogeneous assembly of viruses that were encountered while poliomyelitis studies were being made. Agreement within the committee was obtained by verification of the specificity of each prototype strain in at least two laboratories.

If requested by other investigators, the committee is prepared to assign numbers to new prototype strains that satisfy the criteria employed for differentiation of

the strains listed in Table 1. To avoid unnecessary confusion in the literature, the committee is willing to function as a clearinghouse for characterization of new strains by comparison with established prototypes. In this way the distinction of new prototypes may be hastened.

The antigenic classification presented here is only a preliminary step toward understanding the role that these viruses of the human enteric tract play in disease. If and when any one of the established types is identified as the etiologic agent of a clinically distinct disease, it will be removed from the ECHO group of viruses.

COMMITTEE ON THE ECHO VIRUSES*
National Foundation for
Infantile Paralysis

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22 November 1955

Calcium Uptake by a Coral

In the course of a series of experiments designed to test the usefulness of radioisotope tracers for the study of calcium deposition by corals, we have obtained some interesting data on the common Atlantic coral *Astrangea danae* (1). Pieces of living coral were placed in beakers one-third full of glass beads and containing 40 to 60 ml of sea water that had previously been filtered through No. 4 Whatman filter paper. Stirring and aeration were accomplished by means of jets of water-saturated air impinging on the surface. After the coral polyps became reextended, radioactive calcium-45 in neutralized sea water was added by pipette in amounts sufficient to give about 1000 counts per minute from 0.1-ml aliquots. All samples were spread to uniform area on copper planchets and counted at the same geometry with a 1.8-mg/cm² mica end-window Geiger-Müller tube. The high specific activity of the calcium-45 permitted very small additions of total calcium, never exceeding

Table 1. List of antigenically distinct ECHO viruses.

Type	Prototype strain	Geographic origin*	Illness in person yielding virus	Reference
1	Farouk	Egypt	None	(1)
2	Cornelis	Connecticut	Aseptic meningitis	(1)
3	Morrissey	Connecticut	Aseptic meningitis	(1)
4	Pesasek	Connecticut	Aseptic meningitis	(1)
5	Noyce	Maine	Aseptic meningitis	(1)
6	D'Amori	Rhode Island	Aseptic meningitis	(1)
7	Wallace	Ohio	None†	(2)
8	Bryson	Ohio	None	(2)
9	Hill	Ohio	None†	(2)
10	Lang	Ohio	None	(2)
11	Gregory	Ohio	None	(2)
12	Travis 2-85	Philippine Islands	None	(3)
13	Hamphill 2-188	Philippine Islands	None	(3)

* Strains belonging to type 1 have also been recovered from the Philippine Islands (3) and from India (1). Strains belonging to types 8, 9, 10, 11, and 13 have also been isolated from healthy children in Mexico (2).

† Strains belonging to types 7 and 9 have been recovered from patients having the aseptic meningitis syndrome in West Virginia (1).

Table 1. Calcium equilibrium between coral polyps and sea water. Counts given are means.

Time (hr)	Counts/min per μ l water	Counts/min per mg fresh polyp	Polyps (No.)
6	10.0	9.3	5
11	10.9	9.0	6
23	10.0	7.0	2
31	9.6	9.3	3
50	9.4	8.7	4

Table 2. The calcium-45 content of sea-water samples after various times of contact with living and dead coral as compared with a sea-water control. All counts given are mean counts/min per μ l of water.

Time (hr)	Living coral*	Dead coral†	Control†
1	10.4	3.5	3.2
11	10.6	3.3	3.5
23	11.0	3.2	3.8

* Mean of three experiments.

† Initial calcium-45 activity was one-third that added to the living coral.

0.1 μ g/ml of the final solution, compared with about 400- μ g/ml concentration in normal sea water.

At intervals, polyps were sampled by snipping off the distal half with fine scissors. These were blotted on filter paper, quickly weighed, dried on planchets, and counted. The counts were compared with those made on the sea water, aliquots being taken immediately before and after sampling the polyps. These data are summarized in Table 1, which covers polyps from six different colonies in two separate experiments.

Evidently isotope exchange equilibrium between the polyp-tissue calcium and outside sea-water calcium is reached in less than 6 hours. The exchangeable calcium of the tissues is apparently maintained at about 88 percent of the calcium concentration of the medium. Actually, this figure should be high, because the uncompensated errors from occluded sea water and from the slight differences in self-absorption in the counted samples both tend in that direction. The findings thus agree fairly well with Hosoi's (2) analytic data for tissue calcium in sea anemones (74.5, 72.8 and 66.3 percent of the concentration in medium, respectively, for three species).

In Table 2 the calcium-45 contents of sea-water samples after various times of contact with living coral colonies, or with dead corallum treated in various ways, are compared with blank series that consisted simply of sea-water samples stirred by air, in beakers. The tem-

perature was maintained at 8° to 10°C by circulating sea water. At this temperature *Astrangea* does not appear to grow at all. The withdrawal of calcium-45 by isotopic exchange with the corallum was well below the 5 percent that could have been detected. No effect appeared to be produced by heavy feeding before an experiment, or even during an experiment. Tiny bits of ground fresh fish bone, when these occurred in the food mixture, attained radioactivities per unit volume of 10 to 20 times that of the medium.

The solutions in these experiments contained from 50 to 75 mg of CaCO_3 , whereas the coral specimens represented 4 to 6 g of CaCO_3 . It is evident, then, that isotopic exchange between corallum and medium involved only the free surface of the carbonate crystals and may consequently be assumed to have reached equilibrium rather quickly. This was unexpected, in view of the degree to which all our specimens of *Astrangea* have been riddled with boring sponges. It appears to promise that in experiments on rapidly calcifying reef corals, calcium-45 incorporated by exchange will be readily differentiable from that incorporated by active deposition; it also appears to promise that it will thus be possible to establish actual rates of deposition and to ascertain by what physiological factors the rates are controlled. One of us (T.F.G.) is embarking on such a study.

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References and Notes

- Contribution No. 786, Woods Hole Oceanographic Institution. This work was supported by Office of Naval Research contract Nour 1238-(00). Calcium-45 was obtained from Oak Ridge National Laboratory on allocation from the U.S. Atomic Energy Commission. James McInnis of the Marine Biological Laboratory, Woods Hole, Mass., contributed the living coral.
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16 July 1955

Rapid Method for Cultivation of Acid-Fast Bacilli

An accurate and rapid cultural method for the isolation of acid-fast bacilli is needed. A review of the available literature indicates that there are a number of cultural methods for the isolation of acid-fast bacilli that are less time-consuming than media employed for their routine isolation; but it would appear that each of them has its own particular technical disadvantages.

In the present method, 24 hour specimens of the sputum from patients sus-

Table 1. Composition of media. Before human plasma, blood-water, and penicillin were added, the pH was adjusted to 7.0 and the preparation was sterilized in an autoclave for 15 min at 15-lb pressure.

Compound	No. 1	No. 2
Lecithin (in alcohol)*	0.4 g	0.2 g
$\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$	18.0 g	9.0 g
KH_2PO_4	2.0 g	1.0 g
$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	1.2 g	0.6 g
Sodium citrate	6.0 g	3.0 g
NH_4Cl	10.0 g	5.0 g
Iron ammonium citrate	0.1 g	0.05 g
Asparagine	6.0 g	3.0 g
Glucose	10.0 g	5.0 g
Tween 80 (10% soln.)	4.0 ml	
Distilled water	600.0 ml	500.0 ml
Outdated liquid human plasma	400.0 ml	
Blood-water (50%)†		500.0 ml
Penicillin	100,000 units	50,000 units

* A 2-percent solution of lecithin in 95-percent alcohol is prepared; 20 ml is placed in medium container and gently evaporated to dryness.

† Blood-water is prepared by mixing equal parts of outdated blood-bank blood and sterile distilled water.

pected of having pulmonary tuberculosis were collected. The entire specimen of sputum was homogenized and decontaminated by the addition of an equal amount of 4-percent sodium hydroxide, which contained an indicator. This mixture was shaken vigorously for 10 to 20 minutes and then was incubated at 37.5°C for 30 minutes. Next it was neutralized by adding 25-percent hydrochloric acid dropwise. An equal amount of medium No. 1 (Table 1) was added to the specimen; this mixture was shaken vigorously in an erlenmeyer flask and then was incubated at 37.5°C for 24 hours. The cultural material was then centrifuged at 3000 rev/min for 15 minutes, the supernatant fluid was discarded, and four or five slides were made from the sediment. These were prepared with Ziehl-Neelsen stain and were studied for the presence of acid-fast bacilli.

If acid-fast bacilli were not found, 14 sterile, standard, glass slide preparations were made of the sediment and were air-dried. These were placed in sterile, standard, horizontal glass staining dishes and were covered with medium No. 2 (Table 2). The slides were then incubated at 37.5°C; each day a slide was removed, air-dried, stained by the Ziehl-Neelsen technique, and examined for acid-fast bacilli. If, at the end of 14 days, no acid-fast bacilli had been noted, the test was considered to have been negative. In each instance in developing this method, a sputum sample known to contain acid-fast bacilli was used as a control.

In Table 2 are summarized the results of employing the method and media described here in attempting to cultivate acid-fast bacilli from the sputa of 56

Table 2. Days necessary to detect bacilli. Fifty-six sputa were examined by each cultural method.

Cultural method	Positive sputa (No.)	Avg. No. of days for growth
Medium No. 1 and No. 2	30	2.5
ATS medium	23	31.1

patients suspected of having pulmonary tuberculosis but in whom the sputa were reported as being negative with the Ziehl-Neelsen technique. As parallel and as control cultures, American Trudeau Society medium (ATS) was used as described by Willis and Cummings (1).

It is to be noted that 22 of the sputa cultivated were positive in all media employed. Twenty-five sputa were negative in all media used. Eight sputa were positive in medium 1 or 2, and one sputum was positive in ATS medium but not in medium 1 or 2. In the cultures that were positive, growth of acid-fast bacilli was detected in an average of 2.5 days when medium 1 or 2 was employed, while an average of 31.1 days was required for the detection of growth in the ATS medium.

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19 July 1955

Desynaptic Pseudoassociations in *Secale montanum*

Unusual meiotic chromosome associations were observed at diakinesis in an experimental plant of the grass, *Secale montanum* Guss. The plant was obtained by pollinating an Iranian strain of *S. montanum* with x-rayed pollen of the same strain. Observations were limited, for the plant was accidentally destroyed after a single fixation of pollen mother cell materials had been collected. Nevertheless, it is felt that the observations should be recorded.

The plant proved to be heterozygous for an induced reciprocal translocation, but more striking were the peculiar chromosome associations at diakinesis (Fig. 1A). These unusual bivalents and translocation configurations involved homologous chromosomes that lay side by side, paired along their entire lengths through late diakinesis, yet connected only at their very ends. The connections, which

were simply strands of matrix rather than true chiasmata, were always terminal and connected only corresponding regions of the homologous chromosomes. As is shown in this report, these matrical strands were not effective in maintaining the associations in metaphase I.

Similar meiotic configurations have been designated as "quasibivalents" (1), "pseudobivalents" (2), and as "s-s associations" (3). In terminology, I follow Walters, who uses the original term *pseudobivalent* to describe "... configurations which have a bivalent-like appearance, but which are not formed by chiasmata" (2). However, a more general term, *pseudoassociation*, must be proposed to include the translocation configurations recorded here. Under this terminology, matrical strands that connect the chromosomes are called "pseudochiasmata."

Individual pollen mother cells exhibited both normal and pseudoassociations. An estimated 80 percent of the diakinesis cells contained one or more pseudoassociations. Only six diakinesis cells could be completely analyzed, however. Of the six cells, two showed $5n_n + 1n_p$, two showed $1n_n + 4n_p + 1n_p$ (Fig. 1A), and two cells showed $5n_p + 1n_p$ (n is normal association and p is pseudoassociation). No univalents were observed at diakinesis, but one or more was found in 94 percent of the first metaphase cells. Apparently desynapsis of the diakinesis pseudoassociations was the source of metaphase I univalents. At metaphase I, the univalents moved to the poles ahead of chromosomes of normal configurations (Fig. 1B). Early movement of univalents toward the poles was indicated by the fact that only four lagging chromosomes were seen in 83 anaphase I cells, although first metaphase cells contained an average of 3.7 univalents per cell. About 20 percent of the anaphase I cells showed unequal chromosome distribution. Further stages of meiosis appeared rather normal. Only two out of 54 anaphase II cells contained laggards, and only 7.8 percent of the microspores contained micronuclei.

That the pseudochiasmata were, indeed, matrix strands rather than true chiasmata was suggested, not only by their appearance, but also by the following considerations. Desynapsis showed the terminal connections to be ineffective in maintaining pseudoassociations through the first metaphase of meiosis. If the connections were true chiasmata, it would be difficult to explain their consistent terminal location. It is unlikely that chiasmata would originate only at the chromosome ends. Neither could the terminal position of the strands be explained as products of terminalization, for the chromosomes did not open out as do normal bivalents.



Fig. 1. (A) Diakinesis, one normal bivalent, four pseudobivalents, and one pseudotranslocation association of four chromosomes; (B) Metaphase I, four bivalents and six univalents.

The pseudoassociations showed interesting deviations from the usual meiotic chromosome behavior. Homologous chromosomes ordinarily synapse along their entire lengths in zygotene and pachytene. In diplotene and diakinesis they separate along most of their lengths but remain connected at chiasmata. Resulting configurations have led to the conclusion that homologs repel each other after pachytene and that they are held together only by chiasmata thereafter (4). In diakinesis, the chromosomes of pseudoassociations remained paired along their entire lengths and gave no suggestion of repulsion. Furthermore, the unusual side-by-side association was maintained through late diakinesis without benefit of chiasmata. The terminal strands of matrix could not explain the side-by-side association, for strands were present only at the distal ends of the chromosome arms. Apparently the chromosomes remained paired only through some sort of mutual attraction.

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15 July 1955

New Type of APC Virus from Epidemic Keratoconjunctivitis

Epidemic keratoconjunctivitis (EKC) is an eye infection with sharply defined clinical characteristics, especially the development of round subepithelial corneal

opacities. Despite multiple and conflicting claims, as reviewed by Cockburn (1), "There is at present no virus available that can be regarded with confidence as the etiologic agent of EKC." We have therefore undertaken studies to resolve this problem (2).

Conjunctival and corneal scrapings were obtained from a seaman who had just arrived from the Orient and who suffered from typical EKC. The material was treated with antibiotics and inoculated into twice-washed strain HeLa cell cultures (3). Maintenance medium (10-percent chick serum in mixture 199) was changed every 4 to 5 days. On the 17th day of incubation, cytopathogenic changes appeared in these cultures, and a transmissible agent was passed in HeLa cultures.

The cytopathogenic effects in HeLa cells resembled those described for APC-RI viruses (4, 5). Initially, at the periphery of the cell sheet, cells rounded up and fused into highly refractile clumps. Within the clumps the cells were granular and their outlines were lost. In 2 to 7 days this change spread toward the center of the sheet until the entire culture was involved. The clumps peeled off the glass and floated in the fluid.

The virus was filtrable through Seitz pads and withstood treatment with 30-percent diethyl ether for 18 hours at 4°C. It was not pathogenic by any route of inoculation for suckling or adult mice, guinea pigs, rabbits, or embryonated eggs. A few questionable lesions on chorio-allantoic membranes were eventually shown to be nonspecific. The infective titer (TC 50) in stationary HeLa cell cultures at 36°C up to the present 13th passage has not exceeded 10⁻² dilution of culture fluid. The titer was the same both at the onset of cytopathogenic changes and several days later when degeneration was complete. It was not increased by disrupting the infected cells.

The cytopathogenic effect of this virus was neutralized by a homologous antiserum prepared in rabbits (1 to 160), by pooled human gamma globulin (1 to 10), and by sera from patients with EKC, as described in the next paragraph. It was not neutralized by antiserum to herpes simplex or to St. Louis encephalitis virus (6) or by monotypic antisera to types 1 to 7 of the APC group of agents (7). Fluid from HeLa cell cultures infected with our virus fixed complement with antisera to APC viruses, indicating that our virus possessed the soluble antigen of the APC group (4, 5).

Serums from patients (8) with well-established typical EKC and from individuals with other types of eye diseases were examined for the presence of neutralizing antibodies to our virus. Infected

Table 1. Incidence of neutralizing antibodies to new virus from EKC.

Disease	Location	Year	Patients		
			Total No.	No. with neutralizing antibodies*	No. with definite serological evidence of infection (pos./total)
Typical EKC	Canada	1951	4	4	
	Philadelphia	1953	6	6	
	Chicago	1954	9	9	25/25
	California	1953-55	5	5	
	Canada	1955	1	1	
Herpetic keratitis	California	1949-55	19	1	1/19
Uveitis	California	1954-55	10	1	1/10

* Number of patients whose serum neutralized 50 to 100 TC 50 of virus in a dilution of 1 to 10 or greater.

tissue culture fluid (1 to 2) was mixed with an equal amount of inactivated serum diluted with Hank's balanced salt solution. The mixture was incubated 45 minutes at room temperature and then inoculated into twice-washed HeLa cell cultures (0.2 ml per tube) to which maintenance medium (0.8 ml per tube) was added. The tubes were incubated in a stationary position at 36°C and inspected daily for cytopathogenic effects. Readings were taken for at least 4 days after the control tubes (virus and normal rabbit serum) had degenerated. Cytopathogenic effects were graded 0 to ++++. Agreement between tubes containing the same mixture was good. The result was considered to show neutralization when there was a difference of +++ in readings of experimental and control tubes for at least 2 consecutive days. Virus titrations and positive and negative control sera were included in each test.

The results are summarized in Table 1. All 25 patients with typical EKC observed in 1951-55 possessed neutralizing antibodies in a serum dilution of 1 to 10 (9) or greater from 4 weeks to 3 years after onset of the disease. On the other hand, only two of 29 patients with other types of eye disease had such antibodies. Paired sera from seven patients contained no neutralizing antibodies in a serum dilution of 1 to 5 during the acute illness. All patients with neutralizing antibodies also possessed complement-fixing antibodies to our agent and to RI 67 virus, which merely denoted infection with any of the APC viruses in the recent past.

Follicular conjunctivitis has been observed in patients infected with one of several types of APC viruses, particularly type 3 ("pharyngoconjunctival fever") (10, 11), and type 4 (11). However, severe keratitis with subepithelial opaci-

ties typical of EKC has not been seen in such infections. Furthermore, respiratory symptoms are not associated with the eye disease in epidemics of EKC. Thus EKC does not appear to fit into the pattern of other APC infections (4, 5, 10, 11).

The evidence presented in this paper indicates that the virus which we isolated from a typical case of EKC belongs in the group of APC viruses but does not fit a hitherto established type. No claim is made at this time concerning its etiological role in EKC. However, the serological evidence strongly suggests that this virus was regularly associated with typical EKC during 1951-55 in several localities in North America.

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6. Kindly supplied by E. L. Lennette.
7. These tests were kindly performed by R. J. Huebner and T. Berge.
8. We are indebted to H. L. Ormsby, M. D. Pearlman, and I. H. Leopold for making such sera available to us.
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26 August 1955

Book Reviews

Receptors and Sensory Perception. A discussion of aims, means, and results of electrophysiological research into the process of reception. Ragnar Granit. Yale Univ. Press, New Haven, Conn., 1955. xi + 369 pp. Illus. \$5.

Ragnar Granit, director of the Nobel Institute for Neurophysiology, has written a valuable book that should be read by all who are interested in the nervous system. From reading this book one realizes how much progress has been made during the past few years, and a presentation of the subject, even though confined to a segment of nervous system studies, by one of the most active and prominent workers in the field should be greatly welcomed. For instance, the subject of spontaneous activity in sense organs and its functional significance has not been surveyed before. Detailed research on the mechanisms of centrifugal control of sense organs is only about 10 years old, and the implications of these advances on such problems as control of posture are well stated. This is to be expected since many of the studies were initiated and carried out at the author's institute.

Receptors and Sensory Perception is by no means a neutral review; the author's views are forcefully presented, and there is always an effort made to state general principles rather than mere details. Granit is at his best when he is discussing the functional organization of the nervous system. This is clearly essential, since he aims at narrowing the gap that exists between psychophysics of perception and sense organ physiology. The historical background to problems is as valuable in this book as in the author's previous publication, *Sensory Mechanisms of the Retina*, which appeared in 1947. Topics on visual physiology have been brought up to date, especially in respect to Granit's dominator-modulator theory.

The book, which contains the substance of the 1954 Silliman lectures given at Yale University, concludes with some thoughts concerning the validity and usefulness of the approach and of the concepts that are presented. Granit writes: "everyone makes his own selection from available knowledge, just as in these dis-

cussions I have made mine. It then remains to be seen if they stand the test of time and experimentation. However, one can be quite satisfied if they prove useful for the time being." The usefulness of this book is beyond doubt, although it shows how quickly the field changes and how rapidly new results become superseded.

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Bau der Südamerikanischen Kordillere. Heinrich Gerth. Borntraeger, Berlin, 1955. 264 pp. + plates. DM. 52.50.

This book is the second volume of Gerth's *Geologie von Südamerika*, the first volume of which was published in 1941. Gerth has published numerous good geologic works on South America since 1913. This book represents the best and most thorough compilation of published material on the Andes ever attempted. The author's success in condensing so much factual material into so few pages is remarkable. Relatively few pages of this work deal with theoretical considerations, and it will be invaluable to geologists who desire a good general knowledge of the structure, stratigraphy, igneous geology, and stratigraphic section localities of the Andean belt.

The book is divided into six chapters: Antarctic Andes, south-central Andes, north-central Andes, Caribbean Andes, Andean volcanism, and a summary. Each chapter is divided into sections on the basis of natural geologic-geographic subdivisions. These subdivisions, except possibly in the south-central Andes, are fundamentally sound.

Of several criticisms, the most important is the inadequacy of the number and type of illustrations. The use of a series of small block diagrams to illustrate surface geology and structure of the entire Andes is unique, but the advantage gained is dubious. The result would have been more effective if more structure sections had been utilized in the text and a much larger single-piece geologic map drawn to illustrate the surface geology. The structure sections in the book are not

located on index maps, nor are all of the thousands of geographic place names used in the text located for the reader's use. The result is often confusing. Among the structural sections, one small error was noted: cross sections *c* and *d* on plate 5 opposite page 160 are reversed.

Throughout, the geologic picture presented in the text is basically sound. But several minor remarks and criticisms must be made. The paleogeographic sketch (Fig. 62, p. 235) is cluttered and loses its effect. Each epoch or period would have been clearer if it had been shown on a separate map. The full extent of some of the seaways is not indicated.

Table 3 (after p. 264) is restricted to Cretaceous strata. Thus the discussion (p. 152) of the controversial Quinta-Giron series is nowhere summarized. Tables 2 and 3 do not show the Tertiary, although considerable Tertiary crops out in the areas covered by these tables. All the tables omit the Paleozoic deliberately, although in Bolivia and northern Argentina the Paleozoic is the most important stratigraphic cycle.

Referring to the Paleozoic of Argentina and Chile, the author apparently was unaware of the articles by Suero (1953), Miller and Garner (1953), and the 178-page summary of the Argentine Paleozoic by Keidel (1947). Gerth tentatively correlates the Isla Madre de Dios (Chilean Archipelago) marbles with the Cretaceous (p. 4), but during recent field studies fusulinids have been collected from these rocks.

Gerth also missed the excellent 541-page treatise by Gröber (1952) on the Argentine Mesozoic and Grossling's (1952) review of the Magallanes basin in Chile. Had he seen these articles he would have realized that Thomas' (1949) correlations (p. 13) across this basin are incorrect.

In northern Argentina, northern Chile, and Bolivia, the author (p. 55) dates the Horizonte Calcereo-Dolomitico as Triassic. The dating of this marker bed is important in regional correlations between the north-central and south-central Andes. All available evidence suggests that the Horizonte Calcereo-Dolomitico is no older than Jurassic and is probably Cretaceous.

The discussion of Peruvian geology is the most thorough in the book. The only question that comes to mind is the dating of the base of the Rimac series. Gerth (chap. III, pts. 2 and 3) dates the base as Upper Cretaceous, but regional considerations suggest that the oldest beds are Tertiary.

Although Gerth (p. 220) perpetuates the classic idea of a Caribbean landmass during the Mesozoic, concrete evidence for such a landmass is lacking. However,

the importance of the Turonian-Senonian orogenic phase which is important economically in both North and South America is well brought out.

Although much space has been devoted here to minor criticisms, this work easily excels the best previous efforts of its kind. It will be invaluable, not only to readers with an academic interest in South America, but also to those engaged actively in the task of finding petroleum and other mineral resources.

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Enfermedades Infecciosas y Parasitarias. vols. 1 and 2. Jose Ink. Lopez y Etche-goyen, Buenos Aires, 1953. xv + 1485 pp. Illus. + plates.

This work on infectious and parasitic diseases is intended as a textbook in Spanish for both medical students and practicing physicians. Its two volumes describe the diseases produced in human beings by bacterial, viral, fungal, and parasitic agents.

The author describes the etiology, pathologic anatomy, symptomatology, laboratory diagnosis, treatment, and epidemiology of each disease and gives a brief summary of the main facts that help in identification of morbid conditions. This book not only includes the classical descriptions of diseases but also presents the more modern developments in laboratory diagnosis and the new therapeutic measures that have changed the prognosis of infectious and parasitic ailments.

There are 32 pictures, many in color. The bibliography contains 114 references from both foreign and Argentine sources, and there is an analytic index at the end. The scope of the book is wide; there are references not only to diseases common in Argentina but to many others of world-wide prevalence.

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Causalités et Accidents de la Découverte Scientifique. Illustration de quelques étapes caractéristiques de l'évolution des sciences. R. Taton. Masson, Paris, 1955. 168 pp. Illus. F. 980.

The author of this interesting and unusual book has collected a large number of documents concerning scientific discoveries. The book has the positive merit of having a wide scope, ranging through mathematics, astronomy, physics, chemistry, instrumental techniques, biology, and

medicine, and the negative merit of supporting no specific theory, historical, psychological, or other, but presenting each individual item in its variegated collection for the appreciation and judgment of the reader.

The author remarks in his preface that his objective presentation avoids forcing the complexities of actual scientific research into a systematic schematism. Unfortunately, this avoidance of rigidity has led him into the pitfall of disorder. We are made to jump from antiquity to modern times and to the Renaissance, from spectroscopy to hydrostatics and to typhus, from great names to obscure ones, from basic discoveries to chance observations and to dead ends, from original quotations to amusing anecdotes, so that the very richness of the collection leaves the mind in a whirl. In spite of this, the book will find its place on the shelves of the teacher, the historian, or the philosopher of science; each one will find recorded in it several cases that he has not met before as well as illustrations for his own pet theories. In this he will be aided by two excellent indexes, one of names and one, analytic, of subjects. The plates are also very good.

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Principles of Nuclear Reactor Engineering. Samuel Glasstone. Van Nostrand, New York, 1955. vii + 861 pp. \$7.95.

Samuel Glasstone has attempted to cover the entire field of nuclear energy in one volume. He has been highly successful in presenting a large amount of detailed information, which includes the basic physics and engineering calculations for nuclear reactors. The large gap between the basic design theory and the applications to practical reactor design has been presented in sufficient detail for design of research reactors but not for the design of power reactors. The treatment of most subjects is extremely brief, and incomplete. A great many of the design problems that must be solved by the reactor designer and operator are not mentioned. Nevertheless, the book does contain a wealth of information of value to the beginner in the field of nuclear reactor design. The simple basic principles are presented in a readable manner. Lists of nomenclature are attached to each chapter as well as lists of problems. Some examples of typical calculations are included, but more specific examples would be desirable.

The contents of the book include a review of the calculations of critical mass,

neutron flux distribution, and nuclear reactions; control of reactors; materials; shielding; thermal aspects of reactors; and descriptions of various reactors. The chapter on thermal aspects of reactors is perhaps the best presented.

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Scientific Method in Psychology. Clarence W. Brown and Edwin E. Ghiselli. McGraw-Hill, New York-London, 1955. ix + 368 pp. Illus. \$6.

Scientific Method in Psychology is meant to be a textbook at the undergraduate level. Its purpose is to state the general principles of science and the interpretation that these principles have in psychology. The book is divided into three parts of about equal length. The first part is a simplified idealization of both the scientific method and the scientist. The scientist is characterized as a straight thinker who is individually flexible, tolerant, and free of intellectual biases. He also has a good memory.

In the second part of the book, the authors detail the steps of the scientific method. These are: (i) the definition and delimitation of a scientific problem; (ii) the use of hypotheses in formulating a problem; (iii) collection of the facts; (iv) organization, analysis, and interpretation of the facts; and (v) generalization from scientific data. In part three, some specifically psychological procedures — psychological methods, structured and unstructured tests, interviews, and so forth—are described and compared.

The authors treat the experimental procedures quite competently and give a wide variety of examples. Their handling of more abstract problems of scientific method and particularly of theory, however, is not so sure. In a discussion of three types of facts, they distinguish one that is "remote from sensory experience." This type of fact is a fact that has been thought about by the scientist and thus has acquired meaning. This type of "fact" and "hypotheses," "theories," "interpretations," and "generalizations" become inextricably confused in later chapters. Because these terms are used frequently—and presumably systematically—throughout the text, the confusion is not helpful. Other topics are also perhaps more vague than they need be. For example, the following distinction is made: "Experience, knowledge, and understanding are closely related. They should be placed on a common continuum with experience at the beginning and understanding at the end. From experience we pass through knowledge on

our way to attaining understanding" (p. 96).

The attempt to simplify is frequently accompanied by the failure to make sharply the necessary distinctions. The result is often harder for the beginning student to understand than it would be if a more "difficult" but precise treatment had been offered.

DONALD J. LEWIS

Northwestern University

Electrochemistry in Biology and Medicine. Theodore Shedlovsky, Ed. Wiley, New York; Chapman & Hall, London, 1955. xii + 369 pp. Illus. \$10.50.

The contributions to the symposium on Electrochemistry in Biology and Medicine held by the Electrochemical Society in April 1953 have been assembled in this volume. The 18 papers include both reviews and specialized presentations but fall rather naturally into four groups, depending on the relationship of the electric phenomenon under discussion to the chemical mechanism that produces it.

The first five chapters deal with situations in which the electric parameters can be discussed with some certainty in terms of specific equilibria and ionic transport systems. These are largely concerned with the properties of membranes and, as such, form an excellent, although not systematic, introduction to the following five chapters. In these the essence of the discussion is the identification of the equilibria, transport systems, and enzymatic mechanisms that underlie the transmission of the nerve impulse and other bioelectric phenomena.

There follow four chapters in which electrochemistry is chiefly discussed as a tool for the investigation of simple electrolytes, proteins, and the interaction between proteins and small ions. The final group of four chapters considers electric phenomena, the molecular basis of which is so poorly understood that it is scarcely discussed. The observations on electroencephalograms, for example, are described in terms of their reproducibility and their empirical correlation with physiological factors.

If a justification must be sought for the inclusion of so wide a variety of content in a single volume, it can be found only in the interest that chapters outside the reader's special competence may arouse. Judged in this way the book should prove useful to many. The chapters are stimulating and indicate the emphasis in current research while avoiding in most cases the restricted viewpoint of journal articles.

ROBERT C. WARNER

College of Medicine,
New York University

The Roger Adams Symposium. Wiley, New York; Chapman & Hall, London, 1955. ix + 140 pp. Illus. + plates. \$3.75.

This book contains the papers presented at a symposium in honor of Roger Adams at the University of Illinois (3-4 Sept. 1954). In addition to a biographic sketch by Ernest H. Volwiler, the following accounts are given in this historically significant book: "Steric effects in dyes," by Wallace R. Brode; "The structure of gliotoxin, a sulfur-containing antibiotic substance," by John R. Johnson; "The structure of nepetalic acid," by Samuel M. McElvain; "Chemistry of flavylum salts; reactions with amines," by Ralph L. Shriner; and "Some chemical studies on viruses," by Wendell M. Stanley.

These are a selected few of the distinguished students of Adams. The papers given by them are, as one might have expected, excellent, up-to-date presentations by masters in their respective fields. The diagrams, tables, flow sheets, and illustrations are used effectively. Chemists generally are also indebted to C. S. Marvel and his symposium committee and to the publishers for making available a splendid work of this kind.

It is an altogether fitting tribute to Adams, whose classical studies in organic chemistry have been so inspirational and whose pronounced influence on chemists and chemistry generally have endeared him to so many.

HENRY GILMAN

Iowa State College

Antimetabolites and Cancer. A symposium. Cornelius P. Rhoads, Ed. American Association for the Advancement of Science, Washington, D.C., 1955. vi + 312 pp. Illus. \$5.75; AAAS memb. \$5.

This volume contains 18 contributions to a symposium presented in December 1953 at the Boston meeting of the AAAS. The variety and abundance of the findings in this area of research are impressive. C. P. Rhoads describes the development in the field of cancer research and professes some optimism in considering the probability of the discovery of specific therapeutic agents for neoplastic diseases by extension of the manufacture and screening of antimetabolites.

D. R. Ginder considers viruses as possible therapeutic aids in the treatment of neoplasms, and R. Hertz performs a similar service for hormones. Both men conclude that the lack of knowledge of the mechanisms of action and intermediary metabolism of viruses and hormones obscures any contemporary view of these agents as antimetabolites. S. Weinhouse

finds that the high rate of glycolysis in neoplasms first demonstrated by Warburg is supplementary to other, more efficient metabolic processes that are similar to those demonstrable in normal tissues. Some interesting examples of the inhibition of microbial growth by normal metabolites are given by B. D. Davis, and L. G. Nickell cites numerous compounds that affect plant growth. M. M. Nelson writes of the production of abortions and/or congenital anomalies in rats with antimetabolites of pyridoxine, riboflavin, and folic acid. D. W. Woolley presents studies on the possible oncologic properties of certain synthetic analogs of 1,2-dimethyl-4,5-diaminobenzene, a precursor of vitamin B₁₂.

It is revealing that 10 of the 18 papers in the book deal with antimetabolites of such precursors of nucleic acids as folic acid, leucovorin, purines, and pyrimidines. G. H. Hitchings explains the biochemistry involved and indicates probable sites of action of various antimetabolites with great clarity and precision. E. M. Lansford, Jr., and W. Shive discuss the action of aminopterin on bacteria and describe a microbiological assay method for thymidine. D. W. Visser presents some results on the action of substituted nucleosides in *Neurospora* and bacteria. J. R. Totter finds that aminopterin inhibits the uptake of C¹⁴-formate into desoxyribonucleic acid in rabbit bone marrow *in vitro*. C. A. Nichol and A. D. Welch have discovered that A-methopterin inhibits the conversion of folic acid to folinic acid in *S. faecalis*, and they discuss some possible mechanisms of drug resistance in leukemic cells (including data on cell-free extracts suggesting the importance of cell permeability). H. E. Skipper considers resistance in leukemic cells to 8-azaguanine and A-methopterin in terms of alternate metabolic pathways.

The actions and metabolism of 8-azaguanine are thoroughly reviewed in two papers, one by R. E. Parks, Jr., and the other by H. G. Mandel. G. B. Brown describes the empirical testing program of the Sloan-Kettering Institute for the detection of nucleic acid derivatives with carcinocidal or carcinostatic activity. The only clinical essay in the book, a description of the treatment of acute leukemia, is contributed by J. H. Burchenal. He presents figures on the 50 percent survival time of children with acute leukemia in months: untreated, 3.9; treated with A-methopterin and steroids, 8.9; treated with mercaptopurine, A-methopterin, and steroids, 12. Each paper has a bibliography, and the volume ends with an 11-page discussion of the papers. There is no index.

This book is a good exposition of much of the empirical work and many of the theoretical concepts formulated in the

search for an effective chemotherapy of neoplastic diseases. Relatively little about toxic reactions to antimetabolites and about the chemotherapy of neoplasms other than leukemia is included. That the volume is a bundle of researches in progress, rather than an elegant demonstration of satisfactory therapy, only reflects accurately the present state of affairs.

JOHN H. EDGCOMB

National Cancer Institute

New Books

Transistors and Other Crystal Valves. T. R. Scott. MacDonald & Evans, London; Essential Books, Fairlawn, N.J., 1955. 258 pp. \$7.20.

Drying and Dehydration of Foods. Harry W. von Loesecke. Reinhold, New York; Chapman & Hall, London, 1955. 300 pp. \$7.50.

Water. The Yearbook of Agriculture, 1955. U.S. Dept. of Agriculture, Washington, 1955 (Order from Supt. of Documents, GPO, Washington 25). 751 pp. \$2.

Guide to the Stars. Hector MacPherson. Philosophical Library, New York, new rev. ed., 1955. 144 pp. \$2.75.

The Wing-Venation of the Orthoptera Saltatoria with Notes on Dictyopteran Wing-Venation. D. R. Ragge. British Museum (Natural History), London, 1955. 159 pp. £2.

Die Überfunktion der Nebennieren. Rudolf Chwalla. Wilhelm Maudrich, Vienna, 1955. 330 pp. \$12.

Praktische Mikroskopie. Ewald Schild. Wilhelm Maudrich, Vienna, 1955. 242 pp. \$6.

Clinical Analgetics. E. G. Gross and M. J. Schiffrin. Thomas, Springfield, 1955. 101 pp. \$3.

The Biochemistry of Semen. T. Mann. Methuen, London; Wiley, New York, 1954. 240 pp. \$2.90.

Monograph of the Tenebrionidae of Southern Africa. vol. 1, *Tentyriinae, Molurini—Trachynotina: Somatic Hope.* Transvaal Museum Memoir No. 7. C. Koch. Transvaal Museum, Pretoria, South Africa, 1955. 242 pp.

Organic Syntheses. vol. 35. An annual publication of satisfactory methods for the preparation of organic chemicals. T. L. Cairnes, Ed. Wiley, New York; Chapman & Hall, London, 1955. 122 pp.

Crop Protection. G. J. Rose. Philosophical Library, New York, 1955. 223 pp. \$10.

Virginia at Mid-Century. Jean Gottmann. Holt, New York, 1955. 584 pp. \$7.50.

The Modern Building Encyclopaedia. An authoritative reference to all aspects of the building and allied trades. N. W. Kay, Ed. Philosophical Library, New York, 1955. 768 pp.

De Natura Fossilium (Textbook of Mineralogy). Special Paper 63. Georgius Agricola. Trans. from the first Latin edition by Mark Chance Bandy and Jean A. Bandy for the Mineralogical Soc. of America. Geological Soc. of America, New York 27, 1955. 240 pp.

Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, but to the publisher or agency sponsoring the publication.)

Variation and Genetic Relationships in the Whitlavia and Gymnobythus Phacelias. Publ. in Botany, vol. 28, No. 2. George Willson Gillett. 60 pp. \$1. *A Review of the Nematode Genus Tylenchorhynchus.* Pubs. in Zoology, vol. 61, No. 3. M. W. Allen. 37 pp. \$0.50. Univ. of California Press, Berkeley, 1955.

Progress Reports of Investigation of Railroad Rails and Joint Bars. Eng. Expt. Sta. Reprint Ser. No. 54. R. E. Cramer and R. S. Jensen. 30 pp. \$0.30. *The Removal of Entamoeba Histolytica Cysts from Water by Porous Filter Septums Either with or without Filter Aid.* Eng. Expt. Sta. Bull. No. 431. E. Robert Baumann and Harold E. Babbitt. 40 pp. \$0.60. *Performance of Three Types of Indirect Water Heaters.* Eng. Expt. Sta. Bull. No. 432. Warren S. Harris and Lyman L. Hill. 46 pp. \$0.75. Univ. of Illinois Press, Urbana, 1955.

The National Building Research Institute. Serving the building and structural engineering industries. 15 pp. *The National Physical Laboratory.* Services for science and industry. 23 pp. South African Council for Scientific and Industrial Research, Pretoria, 1955.

Experiments with Soybeans in Australia. Div. of Plant Industry Tech. Paper No. 4. S. G. Gray. 18 pp. *Performance of Some Sown Pasture Species at Trangie, N.S.W.* No. 5. E. C. Cuthbertson, C. A. Neal-Smith, and E. F. Biddiscombe. 11 pp. Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, 1955.

Empirical Equations for the 60-cycle Spark-Over Gradients in Commercial Oil. Reprint Bull. No. 46. W. F. Gauster. 11 pp. *Beneficiation of Olivine by Means of a Humphreys Spiral.* Industrial Information Ser. Bull. No. 10. Mason K. Banks and W. Gay Wells. 19 pp. \$0.35. *X-Ray Methods of Analysis.* Industrial Information Ser. Bull. No. 11. Hans H. Stadelmaier and Elizabeth M. Whitener. 6 pp. \$0.35. Dept. of Engineering Research, North Carolina State College, Raleigh.

Your Life Plans and the Armed Forces and Teacher's Handbook for Your Life Plans and the Armed Forces. Prepared under the direction of the Defense Committee of the North Central Association of Colleges and Secondary Schools. 149 pp. and 23 pp., respectively. American Council on Education, Washington, 1955.

Glosario de Terminologia Forestal. Monogr. No. 5. Carmen García-Piquera. Department of Agriculture and Commerce, San Juan, P.R., 1955. 172 pp.

The Exceptional Child Faces Adulthood. Proceedings of the 1955 spring conference of the Child Research Clinic of the Woods School, held in New York City, 6-7 May. Woods School, Langhorne, Pa., 1955. 114 pp.

Abstracts of the Literature on Semiconducting and Luminescent Materials and their Applications. 1954 issue. Compiled by Battelle Memorial Inst., Wiley, New York; Chapman & Hall, London, 1955. 200 pp. \$5.

Atomic Power and the H-Bomb. C. B. O. Mohr. Melbourne Univ. Press, Melbourne, Australia; Cambridge Univ. Press, New York, 1955. 20 pp. \$0.35.

Nuclear Energy and Its Uses in Peace. Gerald Wendt. UNESCO, Paris, 1955. 76 pp. \$0.50.

Rensselaer Polytechnic Institute, Annual Report, 1954-1955. The Institute, Troy, N.Y., 1955. 52 pp.

Bibliography of Scientific Publications of South Asia (India, Burma, Ceylon). No. 11, January-June 1954. South Asia Science Co-operation Office, New Delhi, 2, India. 212 pp.

National Academy of Sciences-National Research Council, Division of Medical Sciences, Annual Report, 1 July 1954 to 30 June 1955. 53 pp. *Soil and Soil-Aggregate Stabilization.* A symposium. Highway Research Bd. Bull. 108. National Acad. of Science-National Research Council, Washington 25, 1955. 175 pp. \$3.

The Sources of Animal Behavior. An inaugural lecture delivered at University College, London, 5 May 1955. G. P. Wells. University College, London, 1955. 20 pp. 2s. 6d.

Engineering Geology. Historical development, scope, and utilization. vol. 50, No. 3. George A. Kiersch. Colorado School of Mines, Golden, 1955. 122 pp. \$1.50.

Laboratory Study of Wind Tides in Shallow Water. Tech. Memo. No. 61. Beach Erosion Bd., Office of the Chief of Engineers, Washington, D.C., 1955. 50 pp.

Joseph A. Holmes Safety Association, Annual Report. Bureau of Mines, Washington 25, 1955. 123 + 29 pp.

Ohio Fossils. Bull. 54. Aurele La Rocque and Mildred Fisher Marple. Ohio Div. of Geological Survey, Columbus, 1955. 192 pp. \$0.97.

The Washo Road Test. pt. 2, *Test Data, Analyses and Findings.* Highway Research Bd. Special Rept. 22. National Acad. of Science-National Research Council, Washington, 1955. 212 pp. \$3.60.

The Institute of Medical and Veterinary Science, South Australia Sixteenth Annual Report of the Council, July 1953-June 1954. The Institute, Adelaide, Australia, 1955. 106 pp.

The Physical Anthropology of Ireland. Papers of the Peabody Museum of Archaeology and Ethnology, Harvard Univ., vol. XXX, Nos. 1 (text) and 2 (tables and halftones). Earnest A. Hooton and C. Wesley Dupertuis; section on *The West Coast Irish Females* by Helen Dawson. The Museum, Cambridge, Mass., 1955. 304 pp. (No. 1). Paper, \$10; cloth, \$13.

Bibliographical Bulletin of American Anthropology. In commemoration of the Institute's 25th anniversary. vol. XVII, 1954, pt. 1. Pan American Institute of Geography and History, Tacubaya, D.F., Mexico, 1955. 335 pp. \$4. per vol.

Growth, Population Dynamics, and Field Behavior in the Spiny Lobster, Panulirus Interruptus (Randall). Publ. in Zoology, vol. 59, No. 6. Robert G. Lindberg. Univ. of California Press, Berkeley, 1955. 92 pp. \$1.50.

Anales del Instituto Nacional de Antropología e Historia. vol. VI, No. 34, pt. 1a. The Institute, Córdoba, Mexico, 1954. 150 pp.

Scientific Meetings

Medical Sciences

The Council for International Organizations of Medical Sciences (CIOMS) held its third general assembly in Unesco House, Paris, on 30 Sept. and 1 Oct., under the chairmanship of R. E. Tunbridge (United Kingdom).

CIOMS was founded in Brussels in 1949, under the joint auspices of the United Nations Educational, Scientific, and Cultural Organization and the World Health Organization, and groups the majority of nongovernmental international organizations in the field of medicine. Its object is to facilitate the dissemination of knowledge in such ways as to promote advances in medical science and to encourage the utilization of such knowledge throughout the world.

Before drawing up the council's program for the years 1956, 1957, and 1958, the assembly reviewed the present-day problems of communication among medical men. Oral communications between scientists were considered first.

The assembly was concerned with the present trend of international congresses and reexamined the real functions of these meetings in the light of the changed situation brought about by specialization and the increased output of scientific research in various fields. On the one hand, the more general congresses are becoming too large and, what is worse, the number of papers read is too great; opportunities for real discussion are all too rare. On the other hand, specialization tends to increase the number of meetings, and these specialized meetings often lose contact with their parent disciplines. Because international congresses are not the media for reporting scientific discoveries, it was agreed that much could be done to improve the opportunities they offer for personal contacts, for disseminating information to a wide international audience, and for arranging international symposia and other related activities.

Symposia were defined as carefully prepared meetings at which 15 to 20 specialists representing various branches of science gather for several days to discuss a clearly defined subject in private or before a small invited audience. They can be held independently, but they are well suited to be organized several days before a congress. A *rapporteur* can bring

to the larger audience of the congress the conclusions of the smaller group. Special symposia can also be organized in countries in the process of development; they constitute an excellent way of stimulating research and may thus lead to the better practice of medicine.

Written communications were also discussed. It was agreed that there is much duplication between indexing and abstracting services. The difficulties of achieving over-all coordination were stressed but it was thought that action of limited scope should be undertaken whenever opportunities arise. Standardization of terminology is an important activity that the council will continue to encourage as it did in the case of anatomy.

The assembly decided to promote through the council's membership a clearer recognition of the present-day functions of international congresses, a flexible coordination of congresses of related disciplines, a shift from individual participation to group participation through pre-congress working parties and symposia or by the appointment of experts to make digests of related communications, a greater participation of young research workers, and the holding after a congress of special international courses for the host country, in particular cases.

It was decided that the council should continue its policy of organizing symposia on both general subjects and especially important areas of research and that it should stimulate the organization of pre-congress symposia and scientific meetings in underdeveloped countries.

The assembly also instructed the executive committee to explore the possibilities of initiating a program in geopathology. Other business carried out by the assembly included the following items: (i) admission of new member organizations; (ii) election of new members of the executive committee; (iii) appointment of an internal policy board to make recommendations concerning a possible regrouping of member organizations, amendments to the council's statutes, and the appointment of a finance committee to raise funds.

J. F. DELAFRESNAYE
*Council for International Organizations
of Medical Sciences, Paris.*

Meeting Notes

■ A Study Group on Atherosclerosis, the first of its kind to be convened by the World Health Organization, met in Geneva, 7-11 Nov. Participants included 15 specialists from France, Great Britain, Japan, the Netherlands, Sweden, and the United States. Herman E. Hilleboe, Commissioner of Health of the State of New York, was chairman.

Degenerative disease of the heart and arteries is the most frequent cause of death in North America, in most of Europe, and among the more prosperous communities in many parts of the world. The findings of the study group are expected to indicate what directions may be most profitably followed in the field of research and what role WHO can play in correlating the investigations that are carried out in many different countries.

The exact cause of atherosclerosis is unknown but it is believed that three important factors, either singly or in combination, are largely responsible for the disease: a diet too rich in fat, emotional stress, and lack of physical exercise. These were considered by the study group, along with other possible factors, including the use of alcohol and tobacco, sex differences, heredity, constitution, metabolic disorders, intoxicants, infections, and hypertension.

Because the origin of degenerative heart disease is obscure, many points of attack must be envisaged. The WHO study group therefore included experts in epidemiology, statistics, public health, cardiology, pathology, physiology, biochemistry, and nutrition.

■ The 69th meeting of the American Association of Anatomists, by invitation of the Marquette University Medical School, will be held in Milwaukee, Wis., 4-6 Apr. Titles and abstracts of papers, demonstrations, and motion pictures, and demonstration specification cards must be mailed in time to reach the program secretary, Dr. O. P. Jones, University of Buffalo, 3435 Main St., Buffalo 14, N.Y., not later than 9 Jan.

■ An International Congress of Clinical Chemistry is to be held in New York City, 9-14 Sept. 1956, by authorization of the International Federation of Clinical Chemistry and the Commission of Clinical Chemistry of the International Union of Pure and Applied Chemistry. Additional information may be obtained by writing to the congress secretary, Dr. John G. Reinhold, 711 Maloney Bldg., Hospital of the University of Pennsylvania, Philadelphia 4, Pa., U.S.A.

■ The ninth Postgraduate Assembly in Anesthesiology, the annual scientific meeting of the New York State Society of Anesthesiologists, was held at the

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COLUMN—Brass, polished and lacquered.

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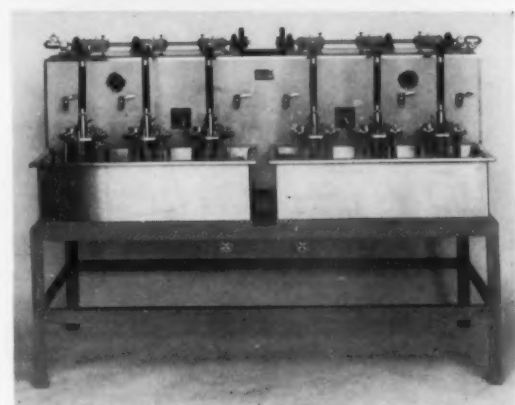
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Hotel New Yorker, 7-10 Dec. Many specialists in anesthesiology and allied fields of medicine conducted panels in "Management of major traumatic injuries," "The electroencephalogram as a tool in anesthesia," "Management of comatose patients," "Present advances in neuropharmacology," "Spinal anesthesia," "Carbon dioxide effects on respiration and circulation," "Pain," and "Cardiac physiology and/or pharmacology." These annual scientific sessions have become the best attended international meetings in this specialty, which this year is celebrating the 50th year of organized anesthesia in this country.

■ Short cuts in time and distance that automation makes possible were demonstrated by exhibits at the International Automation Exposition at Navy Pier, Chicago, Ill., 14-17 Nov. More than 150 exhibitors showed automatic control systems, electronic computers, data-handling equipment, conveyors, counters, communication systems, industrial television, photoelectric controls, positioning equipment, scanning systems, speed controls, automatic production lines, automation components, servomechanisms, switches, relays, and other electric components.

Forty-one companies at the exposition showed data-handling equipment such as

computers, machine controls, and memory-storage units. Much literature was available on the functions of the various components and material on automation and what it means was freely distributed. In addition to the exhibits, nine clinics were held daily on electronic computers, and four were held on conveyors.

Farrand Optical Company displayed an automatically operated milling machine with a keyboard that stores 15 complete operations. By using a punched tape, instructions and dimensions of the parts the machine makes could be sent by an electronic communication system to any factory in the world with similar equipment in probably less than an hour, according to a company spokesman. Richard Rimbach, exposition manager, commented that different languages are no barrier with punch or magnetic tapes and electronic communication systems that handle messages by a code system.

A time saver in the chemical field was exhibited by Precision Scientific Company. This company displayed an automatic chemical analyzer that eliminates such tasks as stirring and continual observation of laboratory work in progress.

An exhibit by the Counter and Control Corporation demonstrated how the programing and automatic recycling of complex switching functions are accomplished by electromechanical means.

A rival to transistors and magnetic cores, the magnistor, was demonstrated by Potter Instrument Company. The new magnetic element is designed for use in high-speed computers, business data-handling systems, automation-control systems, high-speed counters, and magnetic tape systems.

Forthcoming Events

January

12. British Columbia Acad. of Science, Vancouver, Canada. (W. J. Polglase, Dept. of Biochemistry, Univ. of British Columbia, Vancouver 8.)

12-14. Use of Isotopes in Agriculture, East Lansing, Mich. (E. W. Phelan, Argonne National Lab., Lemont, Ill.)

16-18. Documentation Conf., Cleveland, Ohio. (J. H. Spera, School of Library Science, Western Reserve Univ., Cleveland 6.)

17-20. American Pomological Soc., Rochester, N.Y. (R. B. Tukey, Horticulture Dept., Purdue Univ., Lafayette, Ind.)

20-27. Pan American Cong. of Gastro-Enterology, 5th, Havana, Cuba. (N. M. Stapler, 1267 J. E. Uriburu, Buenos Aires, Argentina.)

23-26. American Soc. of Heating and Air-Conditioning Engineers, Cincinnati, Ohio. (A. V. Hutchinson, ASHAE, 62 Worth St., New York 13.)

23-27. Inst. of Aeronautical Sciences,

New York, N.Y. (S. P. Johnston, IAS, 2 E. 64 St., New York 21.)

26-27. Western Spectroscopy Assoc. 3rd annual, Berkeley, Calif. (J. W. Otvos, Shell Development Co., Emeryville, Calif.)

27-28. Conf. on Protein Metabolism, 12th annual, New Brunswick, N.J. (W. H. Cole, Rutgers Univ., New Brunswick.)

27-28. Western Soc. for Clinical Research, 9th annual, Carmel-by-the-Sea, Calif. (A. J. Seaman, Univ. of Oregon Medical School, Portland 1.)

30-1. International Conf. on Fatigue in Aircraft Structures, New York, N.Y. (A. M. Freudenthal, 716 Engineering, Columbia Univ., New York 27.)

30-3. American Inst. of Electrical Engineers, New York, N.Y. (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

31-3. American Soc. of Sugar Beet Technologists, 9th biennial conf., San Francisco, Calif. (Western Beet Sugar Producers, Inc., 461 Market St., San Francisco 5.)

31-4. American Physical Soc., New York, N.Y. (K. K. Darrow, Columbia Univ., New York 27.)

February

1. National Advisory Committee on Local Health Depts., 8th annual, New York, N.Y. (National Health Council, 1790 Broadway, New York 19.)

1-2. Armour Research Foundation Midwest Welding Conf., Chicago, Ill. (H. Schwartzbart, Armour Research Foundation, Illinois Inst. of Technology, Chicago.)

1-3. Case Studies in Operations Research, Cleveland, Ohio. (Operations Research Group, Dept. of Engineering Administration, Case Inst. of Technology, 10900 Euclid Ave., Cleveland 6.)

2-3. National Symposium on Microwave Techniques, Philadelphia, Pa. (S. M. King, Inst. of Radio Engineers, 1 E. 79 St., New York 21.)

5-8. National Citizens' Planning Conf., Washington, D.C. (Miss H. James, 901 Union Trust Bldg., Washington 5.)

9-10. Soc. of American Military Engineers, annual, Chicago, Ill. (D. A. Sullivan, 72 W. Adams St., Chicago 90.)

16-17. National Conf. on Transistor Circuits, 3rd, Philadelphia, Pa. (J. D. Chapline, Remington Rand, Inc., 2300 W. Allegheny Ave., Philadelphia 29.)

19-23. American Inst. of Mining and Metallurgical Engineers, New York, N.Y. (E. O. Kirkendall, AIME, 29 W. 39 St., New York 18.)

19-23. Soc. of Economic Geologists, New York, N.Y. (O. N. Rove, Union Carbide and Carbon Corp., New York 17.)

20-22. American Educational Research Assoc., annual, Atlantic City, N.J. (F. W. Hubbard, AERA, 1201 16 St., NW, Washington 6.)

23-25. National Soc. of College Teachers of Education, Chicago, Ill. (C. A. Eggertsen, School of Education, Univ. of Michigan, Ann Arbor.)

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15-17. Kappa Delta Pi, annual, Stillwater, Okla. (E. I. F. Williams, 238 E. Perry St., Tiffin, Ohio.)

16-18. International Assoc. for Dental Research, St. Louis, Mo. (D. Y. Burrill, 129 E. Broadway, Louisville 2, Ky.)

18-24. American Soc. of Photogrammetry, annual, joint meeting with American Cong. on Surveying and Mapping, Washington, D.C. (ACSM-ASP, Box 470, Washington 4.)

19-22. American Acad. of General Practice Scientific Assembly, 8th annual, Washington, D.C. (AAGP, Broadway at 34th, Kansas City 11, Mo.)

19-22. Inst. of Radio Engineers National Convention, New York, N.Y. (E. K. Gamett, IRE, 1 E. 79 St., New York 21.)

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2-5. Assoc. of American Geographers, annual, Montreal, Canada. (B. W. Adkinson, Library of Congress, Washington 25.)

2-7. Symposium on Crystallography, Madrid, Spain. (M. Abbad, Serrano 118, Madrid.)

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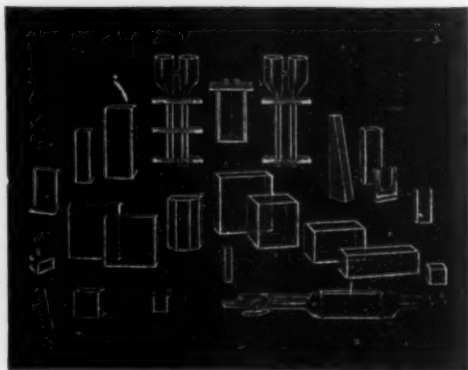
4-6. American Assoc. of Anatomists, annual, Milwaukee, Wis. (N. L. Hoerr, 2119 Adelbert Rd., Cleveland 6, Ohio.)

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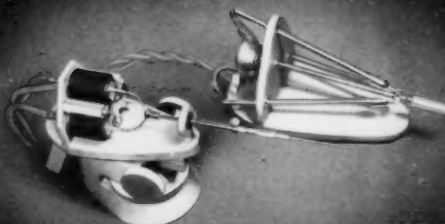
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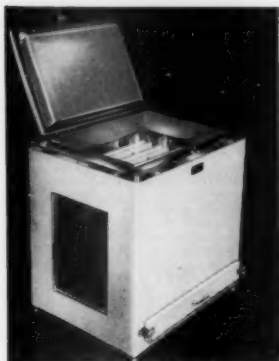
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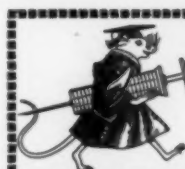
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APPLICATION FOR HOTEL RESERVATIONS

122nd AAAS MEETING

Atlanta, Ga., December 26-31, 1955

The list of hotels and their rates and the reservation coupon below are for your convenience in making your hotel room reservation in Atlanta. Please send your application, *not* to any hotel directly, but to the AAAS Housing Bureau in Atlanta and thereby avoid delay and confusion. The experienced Housing Bureau will make assignments promptly; a confirmation will be sent you in two weeks or less. **As in any city, single-bedded rooms may become scarce; double rooms for single occupancy cost more; if possible, share a twin-bedded room with a colleague—and also save money.** Mail your application *now* to secure your first choice of desired accommodations. All requests for reservations must give a definite date and estimated hour of arrival, and also probable date of departure.

HOTELS AND RATES PER DAY

★ Hotels starred have sessions in their public rooms. Most hotels will place comfortable rollaway beds in rooms or suites at 2.50 or 3.00 per night. For a list of headquarters of each participating society and section—and for information on dormitory accommodations at Atlanta University and Georgia Institute of Technology—please see *Science*, July 22, or *The Scientific Monthly*, August.

Hotel★	Single	Double Bed	Twin Bed	Suite
Georgia Tech Zone				
Atlanta Biltmore★	6.00-10.00	8.00-14.00	10.00-14.00	15.00-50.00
Cox-Carlton	4.00- 6.00	6.00- 8.00	6.00- 8.00	14.00-16.00
Georgian Terrace	5.00- 8.00	8.50-11.00	8.50-12.00	12.00-22.00
Peachtree Manor	5.00- 8.00	7.50- 9.50	8.50-12.00	15.00-28.00
Downtown Zone				
Atlantan	4.00- 5.50	6.00- 8.50	8.50-10.50	17.00
Dinkler Plaza★	6.00- 8.50	7.00-11.50	13.00-15.00	12.00-35.00
Georgia★	4.00- 7.00	6.00- 9.00	7.00-10.00	15.00-20.00
Hampton	2.50- 4.00	3.50- 5.00	5.00- 7.00	
Henry Grady★	5.50-12.00	9.00-12.00	9.50-12.00	16.00-25.00
Imperial	4.00- 5.50	6.00- 6.50	6.50- 7.00	
Jefferson	3.00- 3.50	4.00- 5.00	4.50- 5.00	
Peachtree on Peachtree	5.00- 7.00	7.50-10.50	8.50-10.50	10.00-18.00
Piedmont★	5.50- 8.00	7.50-10.00	10.00-14.00	20.00-25.00

As required by local laws, the following are available for Negro members and visitors:

Royal Hotel	4.00	5.00
214 Auburn Ave., N.E.		
Savoy Hotel	2.50	3.50- 4.50
239 Auburn Ave., N.E.		
University Motel	5.00	8.00
55 Northside Drive, N.W.		

----- THIS IS YOUR HOTEL RESERVATION COUPON -----

AAAS Housing Bureau
Room 912, Rhodes-Haverty Bldg.
Atlanta 3, Ga.

Date of Application

Please reserve the following accommodations for the 122nd Meeting of the AAAS in Atlanta, Dec. 26-31, 1955:

TYPE OF ACCOMMODATION DESIRED

Single Room Desired Rate Maximum Rate
 Double-Bedded Room Desired Rate Maximum Rate Number in party
 Twin-Bedded Room Desired Rate Maximum Rate
 Suite Desired Rate Maximum Rate Sharing this room will be:
 (Attach list if this space is insufficient. The name and address of each person, including yourself, must be listed.)

First Choice Hotel Second Choice Hotel Third Choice Hotel

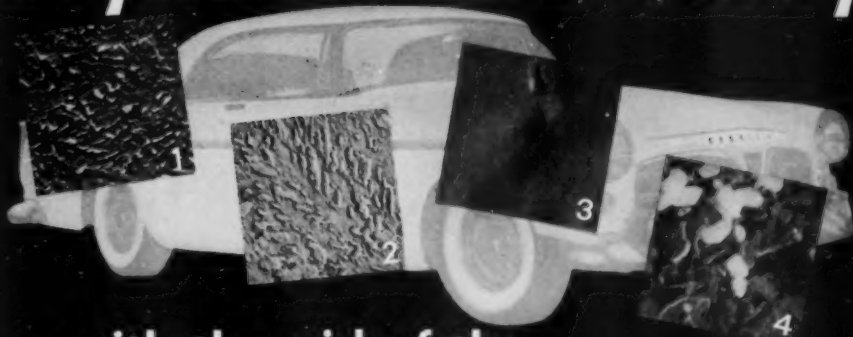
DATE OF ARRIVAL DEPARTURE DATE
 (These must be indicated—add approximate hour, a.m. or p.m.)

NAME
 (Individual requesting reservation) (Please print or type)

ADDRESS
 (Street) (City and Zone) (State)

Mail this now to the Housing Bureau. Rooms will be assigned and confirmed in order of receipt of reservation.

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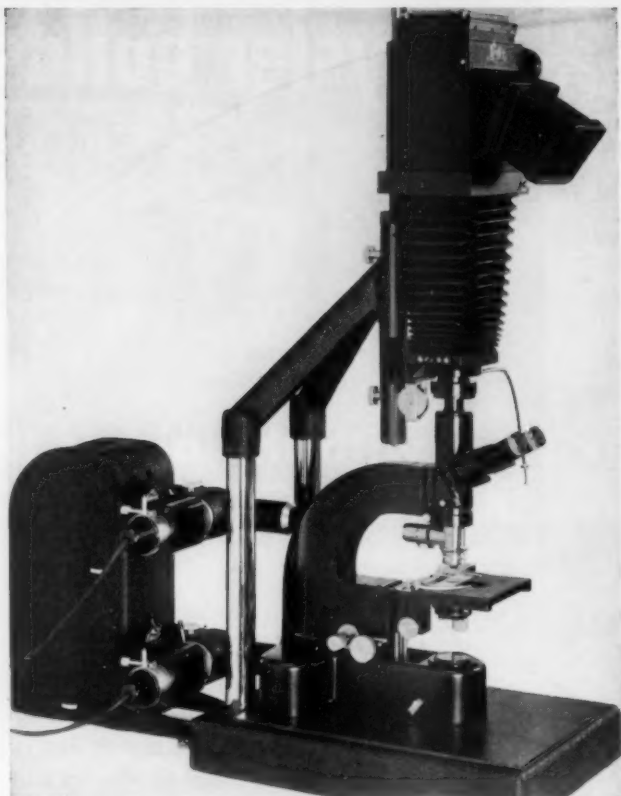
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